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On Reasoning and Argument

Essays in Informal Logic and on Critical Thinking

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Essays in Informal Logic and on Critical Thinking

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Foreword

David Hitchcock is a highly respected Canadian philosopher, prominent in the field of the theory of argument. As many did at the time, he travelled abroad for his graduate training, and like everyone else of his generation working in this field, he began his career with a different area of specialization. He received his Ph.D. from Claremont Graduate School in California with a dissertation in ancient Greek philosophy, a subject he continued to teach alongside courses in critical thinking and argument theory (among other subjects) throughout his academic career. He is both an alumnus of McMaster University in Hamilton, Ontario (B.A., Honours Philosophy), and a professor emeritus at that institution, where he has spent his professional life and continues to be an active scholar and publisher.

Although he has published a textbook for courses teaching critical thinking, *Critical thinking: A guide to evaluating information* (Methuen, 1983), and co-authored with Milos Jenicek a textbook on critical thinking in medicine, *Evidence-based practice: Logic and critical thinking in medicine* (AMA Press, 2005), Prof. Hitchcock has not published a monograph presenting his positions on the theory of argument, informal logic, or critical thinking. That he has views on these topics—carefully considered and closely argued views—is evident from the contents of this book. It is only with this book that we find them gathered conveniently in one place.

On Reasoning and Argument - Essays in Informal Logic and on Critical Thinking presents Hitchcock's selection of a representative sample of his best thinking on a range of topics falling within the scope of its title. It also gives us a good sense of the development of his thinking. The collection brings together in one place 25 of his papers published over the span of the last nearly four decades: four from 1980 to 1989, five from 1990 to 1999, eight from 2000 to 2009, and eight from 2010 to 2016. He has organized the papers into seven themes fitting under the broad umbrella of reasoning and argument. Following the papers in each of these seven groups, Prof. Hitchcock has added a postscript in which he spells out his present views on the topics covered therein. These postscripts, written in 2016, go into such detail as to

constitute seven brand new papers. It is thus more accurate to say that the book contains 32 papers.

A glance at the table of contents reveals a good deal about the breadth and depth of that thinking. It tells us that he approaches reasoning and argument as a philosopher and as a philosopher trained in modern logical theory. It tells us that he has been interested in a wide array of the theoretical questions raised by the so-called informal logic movement since its inception in the 1970s. It reveals an interest in the contribution to the theory of reasoning and argument by the late British American philosopher of science, Stephen Toulmin. And it shows us a theorist who was also a teacher, and we might guess just from some of the chapter titles what their contents reveal, namely that he has been a teacher keenly interested not only in developing the critical thinking skills of his students but also in giving his students as accurate and truthful a picture of reasoning and argument as he could muster.

To those of us who know Prof. Hitchcock as a professional colleague, the table of contents reminds us that he belongs to that subset of thinkers who make up the intellectual conscience of their disciplines. Most scholars aim for accuracy, precision, and insight, among other ideals. A significantly smaller number, however, also have the gift of recognizing dubious features of widely shared assumptions that only close and reflective analysis reveals. Hitchcock's challenges to such matters of faith as that "deductive" and "inductive" denote types of argument or that teaching the informal fallacies is a good way to teach critical thinking exhibit an iconoclastic turn of mind.

The papers grouped within each of the seven topics are presented in the order in which they were written. Thus, we have seven parallel windows into the development of Prof. Hitchcock's thinking. His mind moves from topic to topic over time and keeps circling back to earlier thinking, revising it, extending it, and deepening it.

The two papers in **Part I**, "**Deduction, Induction and Conduction**", share the theme that "distinctions usually taken to apply to arguments (inductive versus deductive, linked versus convergent) in fact apply primarily to supports" (Chap. 3). The first paper combines two of Professor Hitchcock's first forays into the field; the second is a return to those topics many years of reflection later.

We learn from the postscript to **Part II**, "**Material Consequence**", that the seven papers grouped in this part "address the main problem that has occupied [Hitchcock's] attention over the past 40 years". There is a sense, then, that Part II is the heart of the book. That preoccupying problem is "how to evaluate an inference that is neither formally valid nor an obvious non sequitur". What justifies us in asserting that a claim "follows from" or is a "consequence" of given premisses when it does follow even though the inference is not formally valid? In a nutshell, Prof. Hitchcock's solution is that:

> Generic conclusive consequence is constituted by a counterfactual-supporting covering generalization that holds for all its instances. Non-conclusive but possibly adequate support is constituted by such a generalization that holds either for most of its instances or for all instances ceteris paribus (i.e. wherever there is no undermining or overriding exception-making circumstance). (Chap. 10)

The Part II postscript also provides lucid summaries of the seven papers in the part, along with Prof. Hitchcock's latest reflections on the issues they address.

The papers in **Part III**, "**Patterns of Reasoning**", apply the generic conception of conclusive consequence developed in Part II to work out "more specific conceptions of non-conclusive support that in some contexts can be adequate for one's purposes". By working out how this approach applies to "apparently legitimate but usually non-conclusive patterns of reasoning (such as reasoning by analogy, inductive generalization and extrapolation, and means-end reasoning)", the papers in Part III both lend support to the criteria of good reasoning of these sorts and serve as a test for the generic conception of consequence Hitchcock has developed.

Most of the papers in this collection resist the contemporary vogue in argument theory of understanding the concept of argument in terms of the model of a conversation, in particular of a dialogue—a back-and-forth discussion between two people, or more generally such a discussion between two interlocutors who are the bearers of the roles of questioner and answerer or respondent, opponent and proponent, and audience and speaker. While he points out (and documents) that the history of argument theory going back to the Greeks highlights this view, and while he agrees that the study of arguments should take its dialectical features into account, nevertheless, Professor Hitchcock avers, "it goes too far to shoehorn all argument into a dialectical mode". The two papers in **Part IV**, "**Interpersonal Discussion**", are an exception. In Chap. 19, Hitchcock develops a set of principles on the basis of which to formulate rules for cooperative procedures that seem appropriate for what he calls mutual inquiry (the main purpose of which is to secure rational agreement by the participants on the answer to a specified question). His second thoughts about these principles are recorded in the postscript to Part IV. Chapter 20 is a critical review of Ralph Johnson's major theoretical book, *Manifest rationality*, which also gives dialectic pride of place in his theory of argument. The Postscript reveals that Hitchcock today has fewer second thoughts about his criticisms of Johnson's theory.

In two papers on the theme "**Evaluation of Reasoning**", (**Part V**), Hitchcock takes up, in turn, the slippery concept of relevance (for it is intuitive that good reasons must be relevant to the conclusion to which they lead) and the application to argument appraisal provided by Stephen Toulmin's model of argument. As to the first, in Chap. 22, "Relevance", he characterizes premiss relevance as "the ability of an argument's premiss to be ineliminably combined with other at least potentially accurate information to provide a set of premisses that is sufficient to justify the argument's conclusion". Subsequently, Hitchcock realized that there is a counterexample to this account: an example in which the conditions of this account are clearly met, yet the premisses are manifestly irrelevant. In the Postscript (Chap. 24), Hitchcock reviews some other more recent accounts of relevance and also revises his account so as to avoid this counterexample. As to the second, in Chap. 23, "Good reasoning on the Toulmin model", he proposes a method of evaluation for

single-inference reasoning or argument laid out according to Toulmin's data-warrant-qualifier-rebuttal-claim model. In the Postscript, Hitchcock shows how his account can be extended to apply to chains of reasoning.

Professor Hitchcock is sceptical about the notion of fallacy as a property of arguments—as what makes bad arguments bad. Moreover, he is sceptical about teaching students the skills and attitudes of critical thinkers by teaching them to recognize what might be justifiably labelled as fallacies. **Part VI**, "**Fallacies**", contains two papers that thoroughly make the case for his scepticism in these matters and that to my mind succeed in thereby shifting the burden of proof. Anyone who teaches informal logic or critical thinking by including a unit on fallacies needs not only to read these two chapters, but also to be able to meet Hitchcock's sceptical arguments.

We learn in the postscript to **Part VII**, "**Informal Logic and Critical Thinking**", what might not have been evident, but for the subtitle of the book, that Prof. Hitchcock regards all but the three essays on critical thinking in this collection to belong to a branch of philosophy called informal logic. One exception is the chapter against using fallacies to teach critical thinking in Part VI; the other two are the closing chapters, "Critical Thinking as an Educational Ideal" and "The Effectiveness of Instruction in Critical Thinking". Hitchcock sees critical thinking as distinct from informal logic: "… informal logic and critical thinking belong to different genera; informal logic is a branch of study, and critical thinking is a type of thinking". Chapter 28 is an overview of themes taken up by informal logic that make it a branch of philosophy; Chap. 29, along with some modifications to it introduced in the Postscript (Chap. 32), contains Hitchcock's very latest analysis of the concept of argument. Together, Chaps. 28 and 29 "address thematically what informal logic is". Chap. 30 tackles head on the plethora of definitions of "critical thinking" and produces one of the finest accounts of the nature of critical thinking on record. Chapter 31 brings together Hitchcock's study of the effectiveness of computer-assisted instruction in critical thinking with the results of more recent meta-analyses of studies of the effectiveness of various approaches to critical thinking.

I have mentioned the part-closing postscripts more than once. Reading them will help the reader to navigate this big book. In reading them, after reading the articles in each part, one gets the pleasure of experiencing philosophical reflection, reassessment, and revision carried out by a careful analytical mind—the upshot of four decades of rumination. Most importantly, they represent the cutting edge of contemporary philosophy of informal logic.

This book is a trove of treasures. Professor Hitchcock uses his knowledge of ancient Greek and Roman philosophy to illuminate the early history of various concepts. He not only reports, but also conducts empirical studies to support claims about language usage. He positions his views in relation to the recent and current literature on reasoning and argument, be it in philosophy, psychology, speech communication, or education and be it Canadian, American, British, or Continental

European. He offers close, meticulous analyses and broad, comprehensive overviews. This book embodies scholarship at its finest. And it constitutes a compelling argument for the philosophical respectability of informal logic.

October 2016

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Preface

"Why don't you write a book?" So asked my friend and colleague Tony Blair, as we chatted one morning at an academic conference.

The thought percolated in my mind for some months. It occurred to me that there might be some interest in a collection of some of my papers on reasoning and argument published over the last 37 years. I could take the opportunity of assembling them to update my thinking on the issues they addressed, with reference to more recent scholarship.

When I broached this idea to Tony, he gave it his immediate and enthusiastic support. I thank him for planting the initial idea, for his advice on the prospectus, for his support for my proposal to the publisher, and for writing the foreword.

For the collection, I selected the most substantial single-authored papers on reasoning and argument that I have published to date, assigned them to parts by topic, and ordered the papers in each part chronologically. I have ordered the parts chronologically, according to the date of initial publication of the first chapter of each part. At the end of each part, I have written a chapter entitled "Postscript" in which I bring up to date my thinking on the issues addressed in that part. The most substantial new work in those postscripts is my revised account of the concept of argument in the second section of Chap. 32. However, all seven postscripts have new things to say. In particular, I have articulated comprehensive positions on topics about which I have previously written little, such as fallacies and argumentation schemes.

I have edited the previously published articles very lightly, correcting typographical errors, making spelling more uniform, updating references and putting them into the publisher's style, calling each article a chapter, incorporating acknowledgements in an opening bibliographical footnote in each chapter, inserting abstracts and subheadings where there were none, and updating links to resources on the Web where possible. Where I have made a substantive change in the text, I have described it in a footnote introduced by the italicized phrase "*Correction in the present republication*" or "*Change in the present republication*". Also, in response to reviewers' suggestions, I have added footnotes introduced by the

italicized phrase "*Added in the present republication*". Otherwise, the previously published articles are unchanged.

Inevitably, there is some repetition from one chapter to another, since the reprinted chapters were originally written as separate articles, not as components of a single book. The repetition will be especially obvious in the series of papers collected in Part II, in which I develop a conception of material consequence. I ask the reader's indulgence for this repetition, which is never word for word and for which the reader can compensate by skimming over paragraphs and sections that repeat previously read content. It would have been a massive and probably counterproductive task to have condensed, collapsed, and rewritten the chapters in such a way as to avoid repetition. Further, some "repetitions" have changes of detail that reflect a change in thinking.

Since the sequence of chapters is not chronological, but chronological within thematically grouped parts, I list the chapters here in chronological order of the year in which I did the major work of writing them, as a way of making it easier to trace my intellectual journey:

- 1980: Chap. 1 (Deduction, Induction, and Conduction)
- 1986: Chap. 4 (Enthymematic Arguments)
- 1989: Chap. 11 (Validity in Conductive Arguments)
- 1989: Chap. 12 (Reasoning by Analogy: A General Theory)
- 1990: Chap. 19 (Some Principles of Rational Mutual Inquiry)
- 1991: Chap. 22 (Relevance)
- 1993: Chap. 25 (Do the Fallacies have a Place in the Teaching of Reasoning Skills or Critical Thinking?)
- 1994: Chap. 5 (Does the Traditional Treatment of Enthymemes Rest on a Mistake?)
- 1998: Chap. 28 (The Significance of Informal Logic for Philosophy)
- 2001: Chap. 13 (Pollock on Practical Reasoning)
- 2001: Chap. 20 (The Practice of Argumentative Discussion)
- 2002: Chap. 6 (Toulmin's Warrants)
- 2003: Chap. 31 (The Effectiveness of Instruction in Critical Thinking, Parts 1 and 2)
- 2003: Chap. 30 (Critical Thinking as an Educational Ideal, Parts 1 and 2)
- 2005: Chap. 23 (Good Reasoning on the Toulmin Model)
- 2005: Chap. 29 (Informal Logic and the Concept of Argument)
- 2006: Chap. 26 (Is there an *Argumentum Ad Hominem* Fallacy?)
- 2008: Chap. 7 (Non-logical Consequence)
- 2010: Chap. 14 (The Generation of Argumentation Schemes)
- 2010: Chap. 15 (Instrumental Rationality)
- 2011: Chap. 30 (Critical Thinking as an Educational Ideal, Parts 3 and 4)
- 2011: Chap. 8 (Inference Claims)
- 2013: Chap. 16 (Appeals to Considerations)
- 2013: Chap. 9 (Material Consequence and Counterfactuals)
- 2014: Chap. 2 (The Linked-Convergent Distinction)

- 2014: Chap. 31 (The Effectiveness of Instruction in Critical Thinking, Parts 3 and 4)
- 2015: Chap. 17 ("All Things Considered")

A bibliographical footnote at the beginning of each republished chapter provides the data on its earlier publication and, where required, acknowledges permission by the copyright holder to republish the chapter.

It remains to thank colleagues whose criticism has saved me from error and helped me to sharpen my ideas. They are too many to name here; I acknowledge many of them in individual chapters, and their influence is obvious from the frequency with which I cite their work. But, in addition to Tony Blair, already acknowledged, one of them deserves explicit mention: Frans van Eemeren, who with his late colleague Rob Grootendorst first brought researchers investigating argumentation together as a global community. Frans, we are all in your debt. I am honoured by your decision as editor of Springer's Argumentation Library series to approve the present work for publication. Finally, I would like to thank the publisher's two reviewers, Derek Allen and James Freeman, for their careful scrutiny of the manuscript and many useful suggestions for its improvement.

Hamilton, Canada
November 2016

David Hitchcock

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Part I
Deduction, Induction and Conduction

Chapter 1
Deduction, Induction and Conduction

Abstract The position that the deductive-inductive distinction is primarily a distinction between types of support is defended against objections. Allowance is made for additional types of support, notably from relevant but not conclusive considerations.

The last issue of this *Newsletter* featured four articles (Fohr 1980b; Govier 1980b; Johnson 1980; Weddle 1980) on the inductive-deductive distinction. Sherlock Holmes would deduce that practitioners of informal logic have a great deal of interest in this topic. Or should that be "induce"? Perhaps a few more words on the topic will be conducive, if not conductive, to more enlightenment.

In what follows, I first try to situate the dispute about the deductive-inductive distinction within the context of the appraisal of arguments. I respond briefly to Samuel Fohr's objections (Fohr1980b) to my position. I then explore through a series of examples Perry Weddle's renewed claim (Weddle 1980) that all carefully drawn arguments are deductively valid. I concede that it is possible to fill out the premisses of a traditionally inductive argument in such a way as to make it deductively valid, but argue that in general this requires the addition of premisses justifiable only by inductively weak arguments. It is therefore a better strategy in argument appraisal to omit such premisses and take the argument to be inductively strong. Consideration of these examples leads naturally to a discussion of Trudy Govier's defence of a third "conductive" standard of appraisal of arguments. I conclude by advancing amended criteria for determining the appropriate logical standard for appraisal of an argument.

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1.1 The Issue

What is at issue in this debate? As practitioners of informal logic, we are oriented towards the appraisal of arguments which people actually advance in an attempt to convince others (or themselves) to believe or to do something. The question at issue, then, is whether any version of the distinction between deduction and induction is helpful in appraising arguments. If so, which one?

Usually our purpose in appraising an argument is to come to a decision about whether to accept its conclusion. I use the term "cogent" of an argument which deserves to convince us of its conclusion, i.e., which provides adequate grounds for believing or doing what the conclusion says. I take an argument to be cogent for somebody when and only when (l) that person has justifications which are independent of the conclusion for accepting its premisses and (2) the conclusion follows from the premisses. Some arguments are potentially cogent. That is, they would be cogent if they were filled out with premisses which their author perhaps takes for granted as known background information, accepted normative assumptions, and so forth. The cogency or potential cogency of an argument is a relational property; arguments are cogent or potentially cogent to those people who are in possession of relevant evidence. Furthermore, the appraisal of an argument is both an epistemological and a logical matter.

Roughly three positions on the deductive-inductive distinction have emerged.

(1) Perry Weddle (1979, 1980) maintains that we should abandon the deductive-inductive distinction. "… some traditionally inductive and some traditionally deductive arguments provide conclusive grounds for their conclusions and some do not." (Weddle 1979, p. 4). The ones that do not are apparently not carefully enough drawn. We should presumably fill out their premisses and/or hedge their conclusions so that they become deductive in the sense that "it is absolutely impossible for the premisses to be true unless the conclusion is true also." (Weddle 1979, p. 2—quoting Copi 1978, p. 32). Having made the strength of the conclusion proportional to the strength of the premisses, we can evaluate the cogency of the argument by evaluating the acceptability of the premisses. There are then two questions to ask about any argument: Does the conclusion follow deductively from the premisses? What is the relation of the premisses to the world? (Weddle 1979, pp. 4–5)

(2) Samuel Fohr (Fohr 1980a, b) maintains that we should retain the deductive-inductive distinction. Since arguments do not exist in vacuo, but are put forward by persons to convince persons, we should pay attention to the intentions of persons who put them forward. "If a person intends that his premises necessitate his conclusion he is giving a deductive argument. If he intends that his premises render his conclusion probable he is giving an inductive argument." Fohr (1980a, p. 7) could add: If he intends that his premisses be non-conclusively relevant to his conclusion he is giving a conductive argument. And so on. If arguers give no evidence of their intentions, we should ask them whether they intend their premisses to provide conclusive or

probabilistic (or non-conclusively relevant or …) support for their conclusion. If we cannot discover an arguer's intentions in this respect, we must construe the argument as ambiguous and test it against both deductive and inductive (and conductive and …) standards. An arguer who has no intentions about the strength of the link between premisses and conclusion has not put forward a definite argument. Fred Johnson (1980) appears to advocate a variant of this position when he urges that we regard "deductive" and "inductive" as characteristic of arguings (acts of putting forward an argument) rather than of arguments themselves. He wants to revise Fohr's vocabulary in order to avoid misleading our students into making the mistake of taking arguments themselves to be deductive or inductive. Since two people can put forward the same argument with different intentions as to the strength of the relation between premisses and conclusion, it is the arguing and not the argument which is deductive or inductive. Johnson does not say how seriously we should take arguers' intentions in our appraisal either of their arguings or of their arguments, nor does he commit himself on whether there is a defensible distinction between arguments which are deductively valid and those which are inductively strong. Both Fohr and Johnson, however, are likely to think that arguers' intentions about the strength of the link between premisses and conclusion can succeed or fail. If so, they presuppose a prior distinction between two (or more) ways in which the conclusion of an argument can follow from its premiss(es). That is, they presuppose a distinction between deductive validity and inductive strength (and perhaps other kinds of link as well)

(3) I maintain that we should retain the deductive-inductive distinction, not as a distinction between types of argument, but as a distinction between types of validity–or, as Trudy Govier (1980b) puts it, standards of appraisal. An argument is deductively valid if and only if the truth of its premisses guarantees the truth of its conclusion; that is, it is impossible for the premisses to be true and the conclusion false. The description of a possible state of affairs in which its premisses are true and its conclusion false is a refutation of the claim that an argument is deductively valid. An argument is inductively strong if and only if the truth of its premisses makes the conclusion probable. To refute a claim that an argument is inductively strong, we must deploy arguments which show that the conclusion is improbable relative to the evidence contained in the premisses. Trudy Govier (1980b) defends at least one more standard of appraisal, which we might call, after Wellman (1971), a conductive standard. An argument is conductively valid if and only if the truth of its premisses provides non-conclusive relevant reasons for accepting the truth of the conclusion. It is hard to know how to refute a claim that an argument is conductively valid. I shall suggest later that, if the premisses of such arguments are properly filled out, it is not possible to refute a claim to validity for such arguments. The only valid objection to a properly filled out argument for which conductive validity is claimed is an attack on one of its premisses.

As several of my critics pointed out (Fohr 1980b; Govier 1980b; Johnson 1980), in maintaining that there is more than one type of validity, I implicitly commit myself to criteria for determining which standard of validity is appropriate for a given argument. Thus, the distinction between deductive and inductive (and conductive?) arguments reappears as the distinction between arguments for whose appraisal standards of deductive validity are appropriate and those for which inductive standards are appropriate (and those for which conductive standards are appropriate?). I return to this objection at the end of the paper.

1.2 Fohr's Objections

Samuel Fohr (1980b) contends that an arguer who has no intentions about the strength of the link between his premisses and his conclusion has not expressed a unique or definite argument. I find this an odd view, especially since we experts in the field have not yet reached a consensus as to how many possible types of link there are. Weddle says one, I say two, and Govier says three or more. What is the ordinary person to do who simply wishes to express a definite, unambiguous argument? Fohr further suggests that people who have no such intentions may be giving reasons rather than giving an argument. I do not understand this distinction. To me an argument is a set of statements one of which is advanced on the basis of the rest. If I give my wife's promise as a reason why she should help me paint the kitchen, I make two statements one of which ("you should help me paint the kitchen") is advanced on the basis of the other ("you promised you would"). We could even put these statements in standard argument format:

You promised to help me paint the kitchen.
Therefore, you ought to help me paint the kitchen.

It seems to me that any case of giving reasons for an action or a belief is an argument which could be put into such a format. If not, we should have some clarification of the distinction.

Perry Weddle (1980, p. 12) expresses very well a crucial objection to taking arguers' intentions about the strength of the link between their premisses and their conclusion as decisive for the appraisal of their arguments. Typically, he points out, we are not so much concerned to judge the arguer as to judge the argument. We want to come to a decision about how good a justification the argument gives us for accepting the conclusion. I continue to believe that for this purpose the arguers' intentions are at best of heuristic value in determining which standard of appraisal is appropriate.

1.3 Weddle's Deductivism

Perry Weddle (1979, 1980) maintains that some traditionally inductive arguments become deductive arguments when their conclusions are hedged. By calling them deductive he means that it is impossible for the premisses to be true and the conclusion false. The conclusions in question are such probability or likelihood statements as the following:

> It is 95 per cent probable that a sample randomly selected from this population will have a frequency of members having a certain characteristic within 1.96 standard deviations of the mean sample frequency.
>
> It is 95 per cent probable that among Canadian voters with an opinion they are willing to express between 32 and 36 per cent supported the Conservative Party at the time the poll was taken.
>
> It is 95 per cent probable that this drug when taken as directed brings symptomatic relief within one week to at least 50 per cent of sufferers from this disease.
>
> There is a 40 per cent chance of rain today in the Metropolitan Toronto area.
>
> Any child born to this couple has a 25 per cent chance of having sickle cell anemia.

What does it mean to say that such probability statements are true? Clearly the probability is not a property of the state of affairs which "it is probable that" introduces. A sample selected from a population either does or does not have a frequency of a certain characteristic within a defined range. The extent of support at a given time for the Conservative Party among eligible Canadian voters willing to express an opinion is a definite percentage, with no probabilities about it. It either will or will not rain in Metropolitan Toronto today. A child born to this couple either will or will not have sickle cell anemia.

We can interpret the probabilities in question in at least two different ways. One is as properties of the situation prior to the occurrence or non-occurrence of the event described in the "that" clause. In this sense a probability statement would have an objective truth-value, dependent only on the situation at the time, and an explicitly complete description of the relevant features of the situation would provide conclusive grounds for accepting the truth of the probability statement.[1] The other is as epistemic probabilities, as the degree of confidence which the maker of the statement is entitled to have in the truth of the "that" clause on the basis of the evidence at her disposal. In this sense a probability statement has a subjective truth-value, which can change as new information becomes available. I contend that arguments whose conclusions are probability statements in the first sense have been traditionally recognized as deductively valid. Traditionally inductive arguments

[1] *Added in the present republication*: An example of an objective probability is the probability of 0.25 that a man and a woman who are each carriers of the same single-gene recessive disorder will have a baby with that disorder if they conceive a child. One could adopt either a propensity or a frequency account of the probability in question.

have conclusions which, when hedged, become probability statements of the second type. In such cases it is possible for the premisses to be true and the conclusion false. Therefore one cannot make such arguments deductively valid just by hedging the conclusion. One can make them deductively valid by also adding a strong premiss. Such a premiss, however, may lack any justification at all. Furthermore, it can at best be justified by an inductively strong argument, so we are forced at some point to acknowledge weaker than deductive links in cogent arguments. It seems more straightforward to acknowledge such weaker links in the original argument.

I shall develop the above position in terms of a series of examples. In examining these examples I shall respond to Weddle's defense of his position (Weddle 1980) against my earlier objections (Hitchcock 1979).

Weddle considers my objection that uncited counter-evidence may make the hedged conclusion of a traditionally inductive argument false even though the premisses are true. He considers this objection in relation to the following argument:

> (1) Set S consists of 360-member subset A and 6-member subset B.
>
> Smith will select once at random from S.
> Therefore, Smith is likely to select a member of subset A.

Weddle supposes that the uncited counter-evidence would be knowledge of which individual Smith actually selects. If Smith actually selects a member of subset A, the probability is not 360/366 but 1 that he selects a member of subset A. If Smith actually selects a member of subset B, the probability is not 6/366 but 0 that he selects a member of subset A.[2] In either case, the premisses are true but the conclusion false. Weddle deals with this supposed counter-evidence in the following way:

> To object to the original argument on grounds which apply to the *amended* argument would be an *ignoratio elenchi*. The uncited evidence counts only against the amended version. The original was deductively valid come what may (p. 11).

I do not understand this response. In the first place, I do not understand what Weddle means by the amended argument. In the second place, if this further piece of evidence is taken by Weddle to make the conclusion false even though the premisses are still true, how can he maintain that the original argument was deductively valid? By calling an argument deductively valid he means that "it is absolutely impossible for the premisses to be true unless the conclusion is true also" (Weddle 1979, p. 2). How then can an argument be deductively valid when it is capable of having true premisses and a false conclusion?

Actually I am quite prepared to agree that the argument cited by Weddle is deductively valid. My reason for doing so is that I interpret the conclusion as a statement of the property of the situation at the time of utterance. That is, it reports

[2] *Correction in the present republication*: The original article had 'B' instead of 'A'.

the present probability (which, to be precise, is 360/366) that Smith *will* select a member of subset A. Information contemporary with or subsequent to Smith's selection from set S is irrelevant to this probability. Given the truth of the premisses of Weddle's argument, this conclusion is true. Furthermore, no conceivable additional evidence can alter the truth-value of this statement. In other words, it is impossible for the premisses of this argument to be true and the conclusion false.

Weddle's example, therefore, is deductively valid. However, it is not an argument which would be traditionally regarded as inductive. In philosophically sophisticated statistics texts, where such arguments tend to appear, it is pointed out that the conclusion about the characteristics of a sample follows deductively from the premisses about the characteristics of a population and about the randomness of the method of selecting members of the sample. In real life, of course, nobody reasons from the characteristics of populations to the characteristics of samples. We reason from the characteristics of samples to the characteristics of populations.

Let us consider, then, some more typical traditionally inductive arguments with their conclusions hedged and their premisses filled out. On or about January 15, 1977 the Canadian Institute of Public Opinion (i.e., the Gallup poll), at the request of *The Canadian* magazine, surveyed 1043 "representative French-and English-speaking Canadians in interviews across the country." This survey took place two months after the election of a provincial government in Quebec committed to political independence for Quebec. Among the questions the interviewers asked the 1043 respondents was the question: Should the government of Canada negotiate special political and economic agreements with Quebec to try to prevent separation? Of the 1043 respondents, 47.4% (494) said "yes", 43.6% (455), said "no", and 8.7% (91) said "don't know". (We were not told what the remaining three persons said). The report of this survey in *The Canadian* did not make clear from what population the sample was drawn; let us assume it was drawn from eligible Canadian voters living in Canada. Nor did it make clear how the sample was selected; it was probably selected on the basis of stratification and geographical clustering, but to keep things simple let us assume that it was obtained by some method of selection which gave each member of the population an equal chance of being selected as one of the 1043 persons interviewed. Then, looking up appropriate tables in a statistics text, we can construct the following hedged argument:

(2) 1043 respondents were obtained from the population of Canadian voters living in Canada by random selection without replacement.

The population is large enough that this procedure has virtually no probability of giving results different from those obtained by random selection with replacement.

On or about January 15, 1977 an interviewer asked each respondent, "Should the government of Canada negotiate special political and economic agreements with Quebec to try to prevent separation?"

Each person interviewed gave his or her honest opinion at the time.

The process of interviewing did not alter the opinion that any person interviewed had on this question at the time the interview began.

> 47.4 per cent of those asked this question said "Yes".
>
> Therefore, it is 95 per cent probable that on or about January 15, 1977 between 45.3 and 49.5 per cent of Canadian voters living in Canada thought the government of Canada should negotiate special political and economic agreements with Quebec to try to prevent separation.

(Incidentally, I made up the numbers in the conclusion. The important point is that a carefully hedged conclusion of this sort would give a 95 or 99% confidence interval). To assess whether this argument is deductively valid, we have to ask whether it is possible for all the premisses to be true but the conclusion false. I maintain that it is possible, and therefore that the above argument is not deductively valid.

Suppose a rival magazine commissioned another polling organization at exactly the same time to do a survey by the same method of public opinion sampling on exactly the same question. (Such coincidences occur quite commonly during election campaigns, so this is not an outlandish example). Suppose that this polling organization found that 43.2% of 1043 randomly selected respondents said "yes" when asked by an interviewer, and that each person asked gave his or her honest opinion at the time, an opinion not affected by the process of interviewing. Then, looking up our tables, again, we could conclude by a similar argument to the one set out above that it is 95% probable that on or about January 15, 1977 between 41.2 and 45.2% (say) of Canadian voters living in Canada thought the government of Canada should negotiate special political and economic agreements with Quebec to try to prevent separation.

We do not need to go into the mathematics to realize that when we take account of the evidence embodied in the premisses of both arguments the conclusion of the first argument will no longer be true. The probability of the frequency of the indicated opinion being within the range mentioned will be much less than 95%. In fact, if we combine the two poll results together to get a sample twice as large in which 45.3% of the respondents thought Canada should negotiate special agreements with Quebec, we can conclude that it is 95% probable that between 44.1 and 46.5% (say) of the population of eligible Canadian voters living in Canada think Canada should negotiate such special agreements.

The probability in this case is the probability that the method of selecting the sample and of calculating the confidence interval will produce an interval which includes the population frequency of the characteristic being examined. This probability is fixed relative to the premisses; that is, given that the premisses are true, it is impossible for the conclusion to be false. However, when we apply this probability to an estimation of the population frequency, as is commonly done, the probability is not fixed relative to the premisses. New information alters the probabilities. So any conclusion about the frequency of the characteristic in the population, no matter how carefully hedged, does not follow deductively from the premisses.

Of course, we can always add the premiss, "There is no other information relevant to the distribution of opinion on this question among this population at this

time." With this premiss added, the argument becomes deductively valid, since the sort of information which would show the conclusion false even though the premisses are true is explicitly barred by this new premiss. It is this sort of premiss which I called "open-ended." Note that adding it does not change the fact that the probability hedging the conclusion is still probability given the "evidence" cited in the premisses. It is just that one piece of evidence is of a peculiar sort which precludes any other evidence showing up which has a bearing on the conclusion.

Why shouldn't we add this premiss and transform the argument into a deductively valid one? Presumably we are filling out unstated premisses as a preliminary towards making an assessment of the argument. We want to find out whether it is cogent. The next step will be to inquire of each premiss whether it is justified independently of the conclusion. But any premiss strong enough to make a deductively valid argument out of an argument from sample characteristics to population characteristics is incapable of being justified. At least, it can't be justified by a deductively valid argument. All that can be said in support of such a premiss is that no other information relevant to the conclusion is available to the person criticizing the argument and that certain (describable) efforts have been made to find such information. In principle, no such set of efforts can exhaust the possibilities. It's better to cut the knot at the place where it most obviously demands to be cut, and to construe the original argument as inductively strong, thus recognizing that new information can make the conclusion false, even though the premisses continue to be true.

Let us consider another type of argument whose conclusion is a probability statement. First I give an example of an argument which is deductively valid. Sickle cell anemia, geneticists think, is a single-gene recessive characteristic transmitted according to Mendel's laws of segregation and dominance. That is, a human being has sickle cell anemia if and only if he or she has in each non-sex cell in his or her body the gene for sickle cell anemia (which we might call the sickle cell gene) at a given place in both members of a given pair of chromosomes. A person is a carrier of sickle cell trait if and only if he or she has in each non-sex cell at the appropriate places on the chains of chromosomes one sickle cell gene and one normal gene. A carrier does not have sickle cell anemia. However, two carriers who mate can produce a child with sickle cell anemia. Assume two people, Jim and Mary, are carriers. Then we can construct the following argument:

(3) Jim and Mary are carriers of sickle cell anemia.

In reproduction Jim's sperm which have the sickle cell gene have a chance of uniting with a fertile egg equal to that of his sperm with the normal gene.

Likewise, Mary's eggs which have the sickle cell gene have a chance of being fertilized equal to that of those which do not have the normal gene.

Sickle cell anemia is a single-gene recessive trait.

Therefore, if Jim and Mary have a child, that child has a 25% probability of having sickle cell anemia.

This is an argument with a probabilistic conclusion which is deductively valid. That is, it is impossible for the premisses to be true and the conclusion false. One can avoid apparent counterexamples based on knowledge after the fact just as we did in the case of the argument about the sample characteristics based on the population characteristics. Suppose, for example, someone does an amniocentesis on Mary's unborn child, conceived by Jim, and discovers that the child has sickle cell anemia. (I believe there is no such test. However, there might be one.) Then the probability that this child has sickle cell anemia is not 25% but 100% (or slightly less, if there is a margin of error in the test). But this objection is beside the point, because the conclusion ascribes a probability as the property of a situation prior to any conception of a child. "It is now 25% probable that, if Jim and Mary do conceive a child in the future, the child will have sickle cell anemia." What happens once Jim and Mary conceive a child is irrelevant to the truth of the statement thus construed. Such arguments are best construed as arguments from stochastic hypotheses to predictions derived from them. That is, the background of such an argument is a stochastic (probabilistic) theory—in this case, Mendel's theory of the inheritance of single-gene traits. Such a theory I take, in common with a number of contemporary philosophers of science cited by Giere (1979), to be a definition of a system. That is, the theory is a definition of a Mendelian inheritance system for a characteristic as one which obeys Mendel's laws of segregation and dominance. Given the state of such a system at any particular time, one can predict for each male-female pair in the system the probability that one of their offspring will have a certain characteristic.

Now let us consider a parallel traditionally inductive argument. A screening program identifies Jim and Mary as sickle cell carriers. A genetic counselor explains to them what this means and advises them that, if they conceive a child, there is a 25% probability that the child will have sickle cell anemia. We can set out the counselor's argument as follows:

(4) Jim and Mary are carriers of sickle cell anemia.

Sickle cell anemia is a single-gene recessive trait.

Therefore, if Jim and Mary have a child, there is a 25% probability that this child will have sickle cell anemia.

Is this argument deductively valid? I think not. There are possible states of affairs in which the premisses are true and the conclusion false. Suppose, for example, a technique is developed to make the sperm with the sickle gene immobile while keeping the other sperm alive. Suppose that Mary is artificially inseminated with Jim's sperm after they have been treated in this way, and this insemination produces a pregnancy. Then, if the technique is fully effective, there is no probability that the child thus conceived will have sickle cell anemia. So we have a counterexample in which the premisses are true and the conclusion false. The argument is not deductively valid.

What we have done here is to suppose some external interference with the operation of the law of segregation in a Mendelian inheritance system. We have

supposed that the real system of inheritance of characteristics is open to external influences, not closed according to Mendel's laws. In order to block such counterexamples, we have to add a stipulation that the system of transmission of characteristics from Jim and Mary to their children is closed under Mendel's laws.

Why not add such a premiss? Presumably we are filling out unstated premisses as a preliminary towards making an assessment of the argument. We want to find out whether it is cogent. The next step will be to inquire of each premiss whether it is justified independently of the conclusion. But any premiss strong enough to make a deductively valid argument out of an argument from a stochastic hypothesis to a probabilistic prediction is incapable of being justified. At least, it can't be justified by a deductively valid argument. All that can be said in support of such a premiss is that we have no reason to believe that external influences will interfere with the operation of the stochastic system and that certain (describable) efforts have been made to find such reasons. In principle, no such set of efforts can exhaust the possibilities. It's better to cut the knot at the place where it most obviously demands to be cut, and to construe the original argument as inductively strong, thus recognizing that new information can make the conclusion false, even though the premisses continue to be true.

Let us consider Weddle's meteorological example. The argument supporting the conclusion that there is a 70% chance of rain today is as follows:

(5) The data available to us are such-and-such (a low-pressure ridge moving down from the Gulf of Alaska, etc.).

When the data have been such-and-such in the past, it has rained seven out of every ten times on the day after the data have been such-and-such.

Therefore, there is a 70 per cent probability that it will rain tomorrow.

This is not very sophisticated science. No well-developed stochastic theory, analogous to Mendel's theory of the inheritance of single-gene recessive characteristics, underlies the meteorologist's forecasts. Unless the "etc." here is an open-ended "etc." which would be impossible to justify (at least deductively), it is possible that the collection of additional data or the formation of more sophisticated theories would lead to a radical alteration of the probability in the conclusion. That is, it is possible for the premisses to be true and the conclusion false. If this is one of those low pressure ridges for which we could in principle now predict (if we had the right theories and the right data) that it was going to change direction, then the probability of rain tomorrow might be as low as 10%, and desultory rain at that. So it would not be that good an idea to take our umbrella.

This is an example of uncited counter-evidence making the conclusion false even though the premisses remain true. I would object as before to making the argument deductively valid by adding a premiss to the effect that no such counter-evidence is obtainable.

1.4 Conduction

I now turn to an argument which not only illustrates my disagreement with Perry Weddle but also opens up discussion of Trudy Govier's contention (Govier 1980a, b) that there is at least one additional type of link between premisses and conclusion. Consider the following argument:

(6) I wish to buy a new car.

The only considerations relevant to my choice of a model are cost, comfort, safety, handling and reliability.

On each of these factors model X is superior to every other model.

Therefore, all things considered, I should buy model X.

This is a deductively valid argument. That is, it is impossible for the premisses to be true and the conclusion false. However, since this is a traditionally deductive argument, it does not count in favour of Weddle's claim that traditionally inductive arguments when carefully formulated are deductively valid. Nor is it an example of a conductively valid argument. It does, however, suggest an analogous argument which Weddle would claim is deductively valid when carefully formulated and Wellman and Govier would classify as conductively valid.

To get a close analogue we could construct an imaginary argument which someone about to buy a new car might use in making up her mind. However, I have chosen a real argument which is a somewhat more distant analogue. It comes from the "News from the World of Medicine" section of the December 1977 *Reader's Digest* (Canadian edition):

(7) Don't drink if you're pregnant. According to Dr. Joseph R. Cruse of the University of Southern California, women drinking any alcohol at all may run a risk of irreparable damage to their unborn babies …

This brief excerpt combines an appeal to authority with a good reason for an omission. We might put the argument into standard form and fill out its premisses as follows:

Dr. Cruse says that pregnant women drinking any alcohol at all may risk causing irreparable damage to their babies.

Dr. Cruse has the expertise required to make reliable judgments on this question.

Dr. Cruse is saying what he honestly believes.

Other things being equal, pregnant women should not do anything which subjects their babies to a possible risk of irreparable damage.

Therefore, all things considered, you should not drink if you're pregnant.

I add the last premiss in order to bring out what I take to be the logic of such arguments. Wellman (1971) maintains that the validity of each conductively valid argument is *sui generis*, that there is no general form of argument in terms of which such arguments are valid. I think, however, that there are always assumptions in such arguments that the reasons advanced are relevant to the recommendation drawn from them, and such assumptions are best expressed in terms of *ceteris paribus* statements. When such tacit premisses are made explicit, arguments of this sort are always valid. One can only object to them by questioning the truth of a premiss or by citing additional reasons.[3]

Incidentally, it would not be fair to this argument to supply a strong normative premiss which makes it deductively valid. Such a strong premiss would be open to obvious counterexamples. It is just not true that no pregnant woman should do anything which subjects her baby to a possible risk of irreparable damage, no matter what the circumstances. A pregnant woman cannot avoid doing some things which carry a possible risk of such damage, and nobody is obligated to do the impossible.

Now let us consider the strength of the link between premisses and conclusion in the argument as I expanded it above. Is the argument deductively valid? Suppose the premisses true, and consider how the conclusion could still be false. Unless "run a risk" is a reporter's pleonasm, it probably captures the professor's hesitation about extrapolating empirical data concerning the effects of high doses of alcohol on unborn babies to the effects of low doses. In this type of research, a linear hypothesis about the relationship of dose and response is usually assumed. That is, if consuming 20 oz of alcohol per day carries a 70% risk of irreparable damage to an unborn child, it is assumed that consuming one ounce of alcohol per week carries a 1/2 of 1% (70 divided by 20, divided by 7) risk of irreparable damage to an unborn child. An alternative hypothesis is that there is a threshold dose below which there is no response at all. The "may" probably reflects uncertainty about the truth of the linear hypothesis. The difficulty is that it is almost impossible to do a crucial experiment to decide between the linear and the threshold hypothesis. Suppose, however, that such an experiment is performed, and the threshold hypothesis wins out. Then the reason for drinking no alcohol at all no longer obtains. Assuming no other reasons for not drinking alcohol, the conclusion is no longer true. Again, there may be good reasons for a pregnant woman to drink alcohol which override the possible risk of damage to her unborn child. (It is hard to think of any, but her personal enjoyment might be enough to override a merely possible very remote risk of minor damage). So there are at least two ways in which the premisses could be true and the conclusion false.

[3] *Added in the present republication*: One might wonder how the argument can be valid if one can object to it by citing additional reasons. The answer is that this chapter uses the term 'valid' in a broad sense that includes inductive strength and conductive adequacy as well as deductive validity. In this broad sense, it is possible to object to valid arguments by citing additional reasons that count against the conclusion or the inference, as long as their "validity" is not deductive validity.

Now we could add further premisses to prevent such counterexamples from being constructed. We might, for example, add the assumption that no further evidence will arise which contradicts Dr. Cruse's assertion. And we might add the assumption that no competing considerations outweigh the possible risk of irreparable damage to an unborn child. But it is impossible to justify the first of these assumptions, and difficult to justify the second one. Any such justification would involve arguments which are not deductively valid. So on Weddle's theory we would have to conclude that this is not a cogent argument. This seems to be the wrong appraisal. If we could justify the premisses of the expanded argument which I set out above, then we would have a cogent argument which, however, was not deductively valid. We would have to recognize that, since the premisses provide non-conclusive support for the conclusion, further evidence might arise or further considerations be appealed to which would lead reasonable people to reject the conclusion, even though they still accepted all the premisses of the original argument.

Perry Weddle might suggest hedging the conclusion of the argument in order to make it deductively valid. That is, instead of concluding that, all things considered, you should not drink if you're pregnant, the reporter ought to have proportioned the strength of his conclusion to the strength of his premisses and concluded that, other things being equal, you should not drink if you're pregnant. Here the relativity of the conclusion to the premisses is patent, because the "other" means "other than what is cited in the premisses". Further reasons for or against drinking while pregnant could change the truth-value of this statement. Furthermore, it is not in general possible to hedge conclusions which are recommendations for action. In reasoning about what to do, we are interested in coming to a decision about what to do. At some point, we have to make an "all things considered" judgment and act. "Other things being equal" conclusions are not enough. Thus, hedging the conclusion of such arguments does not make them deductively valid, nor (in general) is it possible.

Trudy Govier wishes to distinguish arguments whose premisses are non-conclusively relevant to their conclusion from arguments whose premisses make their conclusion probable. She seems to have two reasons for making this distinction. In the first place, following Wellman, she takes the concept of probability to have its natural application to the confirmation of empirical hypotheses by supporting evidence. As such evidence accumulates, and no disconfirming evidence is found, the probability of the empirical hypothesis increases. But this is too narrow a range of application, as some of the examples above indicate. The probability of an empirical hypothesis like the special theory of relativity is quite unlike the probability that a certain percentage of eligible Canadian voters living in Canada think Canada should negotiate special arrangements with Quebec to prevent it from separating. The probability that an individual randomly selected from a population will belong to a certain subset of that population is something else again. And the probability that it will rain today in Metropolitan Toronto or that a couple's

next child will have sickle cell anemia is a probability attaching to the consequence of an empirical stochastic hypothesis.[4].

In the second place, Govier argues that it is linguistically unnatural to speak of considerations for or against a certain action as making it probable that one should perform or omit that action. Suppose, for example, that legalizing euthanasia carries a great danger of abuse and that we never know for certain that a person is incurably ill. These two considerations are relevant considerations against legalizing euthanasia, but it is unnatural to say that their truth makes it improbable that we should legalize euthanasia. Likewise, when Quebec Liberal party leader Claude Ryan uses an analogy with the time it takes to raise a family of five to support his claim that Canada has not reached political maturity, it is unnatural to say that this analogy, if it has some force, makes it probable that Canada has not reached political maturity.

Appeals to natural linguistic usage are not very compelling unless they are supported by some rationale. In any living language, the range of application of words is constantly changing. If there is an obvious extension of the range of application of an existing word, why not extend it? What is crucial, therefore, is the reasons why we find it unnatural to extend the meaning of a word, in this case the meaning of "probable". The reasons why the word "probability" seems unnatural in cases where the premisses are non-conclusively relevant to the conclusion seems to be that the concept of probability includes a cardinal measure. That is, if we say that something is probable, we can always be asked "How probable?" and be expected to give an answer which is either a percentage figure or a fraction between 0 and 1. (In my examples above, I deliberately included such percentages.) But such responses are impossible in cases where relevant reasons are being given for doing something or relevant criteria are being cited, either directly or through an analogy, in favour of a certain classification of a phenomenon.

We should not exaggerate this difference between cases where the premisses would naturally be said to make the conclusion probable and cases where the premisses would naturally be said to provide relevant but non-conclusive reasons for accepting the conclusion. If the hypothesis that sickle cell anemia is a single-gene recessive characteristic is confirmed by examination of thousands of family histories, such evidence makes it very probable that the hypothesis is true. But we cannot cardinally measure this probability. We can recognize that an examination of thousands more cases which likewise showed the same pattern of inheritance consistent with the hypothesis would increase the probability. And we can recognize that the discovery of some patterns of inheritance which were highly unlikely on that hypothesis would reduce the probability. So we can make some ordinal comparisons between the statuses of the hypothesis relative to different bodies of evidence. We cannot make ordinal comparisons very well between the

[4]*Added in the present republication*: The difference between the last two kinds of probabilities is that the percentage of the population belonging to the subset is a known datum (e.g. from a recent census) rather than an empirically supported general hypothesis. In Toulmin's vocabulary, the first sort of probability is a mathematical deduction from data, whereas the second sort of probability is an inference from data justified by established warrants.

probability that this hypothesis is true and the probability that another well-confirmed hypothesis (e.g., that Tay-Sachs disease is a single-gene recessive characteristic) is true.

This is precisely our situation with respect to the sorts of arguments which Govier cites. If we believe that failure to legalize euthanasia would condemn thousands of dying persons to long periods of extreme pain, that would be a competing consideration which would reduce our confidence that we should not legalize euthanasia. If we reflect on the pressures which legalized euthanasia would put on elderly people to consent to being killed in a country where there will be increasing resentment at the burden on its resources represented by an increasingly large proportion of elderly people, that would be an additional consideration increasing our confidence that we should not legalize euthanasia. Of course, we cannot make ordinal comparisons very easily (if at all) between the extent to which the two considerations cited by Govier militate against legalizing euthanasia and the extent to which the possible risk of irreparable damage to unborn children militates against a woman drinking alcohol while she is pregnant. Likewise, if further relevant similarities between raising a family of five and bringing the provinces of a disparate country to political maturity emerge, they would increase our confidence that Canada has not yet reached political maturity. If relevant dissimilarities emerge, such as the fact that some provinces had a history of partial self-government prior to Confederation, they would decrease our confidence that Canada has not yet reached political maturity. Of course, we cannot make ordinal comparisons very easily (if at all) between the extent to which (l) Claude Ryan's analogy between children reaching maturity and a country reaching maturity supports the claim that Canada has not reached political maturity and the extent to which (2) the popular analogy between the possible separation of Quebec from Canada and the possible separation of a woman from her husband supports the claim that there should be a national referendum in which the rest of Canada has the opportunity to reassure Quebec that Canada wishes Quebec to remain within Confederation. In all these respects there seem to be close parallels between the extent to which evidence confirms an empirical hypothesis and the extent to which relevant considerations or similarities support a decision or a classification. It seems difficult to justify making a fundamental distinction between these two types of links between premisses and conclusion.

In my view, the important distinction among cogent arguments with regard to the link between their premisses and their conclusion is that between those arguments where the truth of the premisses guarantees the truth of the conclusion (there is no possible state of affairs in which the premisses are true and the conclusion false) and those arguments where the truth of the premisses provides non-conclusive grounds for accepting the conclusion (there is a possible state of affairs in which the premisses are true and the conclusion false, but the premisses make the conclusion probable or provide relevant reasons in its favour). In some of the latter sorts of oases, we can quantify the strength of the link between premisses and conclusion; in others, we cannot. In either case, we must recognize that we are dealing with an argument where not only new information about the truth-value of

the premisses but also new information independent of the truth-value of the premisses but relevant to the conclusion should lead us to re-examine our acceptance of the conclusion. Certainly there is a wide variety of types of argument within the second broad classification of non-deductively valid arguments. And the types of logic appropriate to the assessment of their validity go far beyond those traditionally encompassed by texts on inductive logic. If a difference is to be made among this second broad class of arguments, it might be on the basis of the sort of tacit premisses which one normally adds in filling out the elliptical arguments which people present. In the case of apparently conductive arguments, these are typically of the form, "Other things being equal, anything with property *A* also has property *B*." (Property *A* could be a criterion for classification or a reason for doing something or a relevant similarity between analogous cases.) In the case of apparently inductive arguments, it is not appropriate to fill out the premisses with such statements.

1.5 Which Standard of Appraisal?

Let me turn finally to the implications of a distinction among types of argument validity for the classification of arguments. If one maintains that cogent arguments can be deductively valid or inductively strong (or conductively valid), then one has to decide which standard to use in appraising an argument. This means that one must at least tentatively classify the argument as deductive or inductive (or conductive), in the sense that it is appropriately appraised by deductive or inductive (or conductive) standards of validity. In my earlier article I suggested that this classification should be done on the basis of the apparent logical form of the argument. Fred Johnson's comments (7) have convinced me that such an approach to the classification of arguments is too rigid and narrow.

I suggest instead that we use a version of the principle of charity in settling on the standards by which to assess an argument. That is, we should assess it by those standards which give it the best chance of being a cogent argument. In practice, this means that we should fill out elliptical arguments with premisses which stand a chance of being justified and which make the argument deductively valid or inductively strong (or conductively valid).. Now it may be that an argument will have a roughly equal chance of being cogent if we fill it out with premisses which enable us to test for deductive validity and if we fill it out with premisses which enable us to test it for inductive strength. For example, it might lack cogency on either interpretation. Or it might be very cogent on either interpretation. How are we to classify such an argument? We can say that it is both deductive and inductive, or that it is neither. Nothing much hinges on our decision between these alternatives. In this sense, I would argue, classifying arguments as deductive or inductive (or conductive) is at best a tentative matter, one which does not produce a neat division of arguments into mutually exclusive and jointly exhaustive kinds. We do, however, have a mutually exclusive and jointly exhaustive division into kinds of

standards for appraising the link in an argument between premisses and conclusion. It is this division which justifies reference to deduction, induction and perhaps conduction as distinct types of reasoning.

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Chapter 2
The Linked-Convergent Distinction

Abstract The linked-convergent distinction introduced by Stephen Thomas in 1977 is primarily a distinction between ways in which two or more reasons can directly support a claim, and only derivatively a distinction between types of structures, arguments, reasoning, reasons, or premisses. As with the deductive-inductive distinction, there may be no fact of the matter as to whether a given multi-premiss argument is linked or convergent.

2.1 Introduction

Once upon a time introductory logic textbooks did not mention the linked-convergent distinction. See for example Cohen and Nagel (1934), Black (1946), and Copi (1978). Stephen Thomas was the first one to draw it, in 1977.[1] Thomas took the term 'convergent' from Monroe Beardsley's earlier textbook, from which come also the terms 'divergent argument' and 'serial argument' (Beardsley 1950, p. 19). A contrast concept was already implicit in Beardsley's recognition that a reason that "converges" along with one or more other reasons on a conclusion might itself consist internally of more than one coordinate premiss. Thomas refined Beardsley's concept of convergence, made the contrast concept explicit, coined the term 'linked' for it, and supplemented Beardsley's convention for diagramming convergent reasons with a convention for diagramming the linkage among the coordinate premisses of a multi-premiss reason. Independently

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[1]He claims *(Thomas 1986, p. 457) to have introduced it in the 1973 edition of his *Practical Reasoning in Natural Language*, but I have been unable to find a copy of this textbook published before 1977, despite the claim (Thomas 1977, p. ii) of copyright in 1973, 1974 and 1975.

D. Hitchcock, *On Reasoning and Argument*, Argumentation Library 30,
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of Thomas's innovation, Scriven (1976, p. 42) introduced a similar distinction, with a different diagramming convention, but used the term 'balance of considerations' to describe an argument with a convergent support structure. Johnson and Blair (1977, p. 177) and Hitchcock (1983, pp. 49–52) appropriate Scriven's way of making the distinction.

The distinction appears with Thomas's labels and diagramming conventions as a topic in many introductory textbooks. See for example Freeman (1993, pp. 86–106), Ennis (1996, p. 39), LeBlanc (1998, pp. 32–36), Fisher (2001, pp. 32–38), Bailin and Battersby (2010, pp. 42–44), Govier (2010, pp. 37–39), Vaughn and MacDonald (2010, pp. 95–96), and Groarke and Tindale (2013, pp. 115–119). Many of these textbooks explain the distinction in one short section, with exercises on applying it, but neither mention nor use the distinction elsewhere–a sign that its inclusion has become a piece of scholasticism.

The distinction is intuitively clear. Where more than one premiss is offered in direct support of a conclusion, the premisses sometimes work together to support it and are in this sense linked, whereas at other times distinct subsets of them offer independently relevant reasons that "converge" on the conclusion. A paradigm case of linked support would be a deductively valid two-premiss argument where neither premiss by itself entails the conclusion, such as the argument:

> (1) There is no life on Mars, because its atmosphere is in a stable equilibrium, which would not be the case if there were life on that planet.

A paradigm case of convergent support would be an appeal to disparate considerations or criteria in support of the attribution of some supervenient status to their common subject, such as the following argument:

> (2) There should be no capital punishment. The death penalty violates human rights codes that forbid cruel and unusual punishment, cannot be reversed or compensated for if it is discovered that a person was innocent of the crime for which they were executed, is no less effective as a deterrent than the likely alternative of a long prison term, and is not needed to prevent a person convicted of a capital crime from repeating that crime.

Despite this intuitive clarity, it has turned out to be difficult to spell out theoretically when premisses are linked and when they "converge". This difficulty has given rise to several scholarly treatments of the distinction, among which Walton (1996) and Freeman (2011) stand out for making it a major focus of their books on argument structure.

In this paper I wish to make one main point: that the distinction is primarily a distinction among types of support, not among arguments, premisses, reasons or structures. Only derivatively can we apply the distinction to arguments, premisses, reasons and structures. This point seems to me to be obvious once one is made aware of it, but it seems not to have been made in the literature. It implies that it is futile to look for a criterion of linkage in the consequences for the strength of support of finding a premiss questionable or false (e.g. no support upon falsification, diminished type of support upon elimination, etc.). Nevertheless, I shall argue, the distinction is useful.

2.2 Convergence: Not Multiplicity of Arguments

Initially we should be clear that the linked-convergent distinction is not a distinction between a single multi-premiss argument and multiple independent arguments. There is nothing particularly problematic about the concept of distinct arguments for a single conclusion. We have clear examples of such "piling on" of arguments, as in Aristotle's 21 arguments in his *Metaphysics* against Plato's theory of forms (Aristotle 1984 [4th century BCE], 988a1-8 and 990a34-993a10), Thomas Aquinas's five ways of proving the existence of God (Aquinas 1913[1269], I, Q. 2, Art. 3), and the 367 different ways of proving the Pythagorean theorem (http://www.wikihow.com/Prove-the-Pythagorean-Theorem; accessed 2016 08 11). The appropriate response to such texts is to treat each argument by itself: identifying, analyzing, interpreting and evaluating it as if no other argument for the conclusion were in the offing.

There is however some controversy over how to combine the results of such evaluations. Pollock (1995, pp. 101–102) doubts that there is accrual of independent reasons, and assumes that the degree of justification for a conclusion supported by separate undefeated arguments is simply the maximum of the strengths of those arguments. He argues that cases adduced as evidence of accrual of independent reasons, such as the greater reliability of testimony when given independently by two witnesses than when given by just one of them, are in fact cases where the separate pieces of information function as premisses of a single argument. Selinger (2014) on the other hand takes a new argument to reduce the uncertainty left by any preceding arguments for the same conclusion, provided that the premisses of the new argument are independent of the premisses of its predecessors. On the basis of this intuition, he provides a formula for calculating the degree of acceptability conferred on a conclusion by a set of such independent arguments. The inputs to this formula are provided by a valuation function which assigns to each premiss and each inference (but not to the conclusion) degrees of acceptability ranging from 0 for complete unacceptability via ½ for being neither acceptable nor unacceptable to 1 for complete acceptability. Let $v(\alpha_{ij})$ be the degree of acceptability of a premiss α_{ij} of an argument j with conclusion α, and $w(\alpha|\alpha_{1j},\ldots,\alpha_{nj})$ be the degree of conditional acceptability in this argument of its conclusion α given total acceptability of its premisses $\alpha_{1j},\ldots,\alpha_{nj}$. If the premisses of this argument are independent and the product of their degrees of acceptability is greater than ½ (meaning that the conjunction of the premisses is more acceptable than not), then the degree of acceptability $v_j(\alpha)$ conferred on the conclusion α by the argument is the product $v(\alpha_{1j}) \cdot \cdots \cdot v(\alpha_{nj}) \cdot w(\alpha_j|\alpha_{1j},\ldots,\alpha_{nj})$. (This formula can be adjusted to accommodate cases where the premisses of an argument are not independent of one another.) The degree of acceptability conferred on α by m such arguments ($m > 1$) with independent premisses is given by the formula $v_1(\alpha) \oplus \cdots \oplus v_m(\alpha)$, where $x \oplus y = 2x + 2y - 2xy - 1$. Selinger's formula appears to give intuitively acceptable results. For example, according to the formula two independent proofs that each confer separately a total acceptability of 1 on a theorem confer together

the same acceptability of 1, whereas two independent arguments that each confer an acceptability of 3/4 on a claim together confer an acceptability of 7/8 and a new independent argument that confers an acceptability on a claim only slightly greater than ½ raises the acceptability of this claim by a very small amount. Thus the conflict between Pollock's rejection of accrual of independent reasons and Selinger's acceptance of this sort of accrual comes down to a conflict of intuitions. It is an open question whether there is any compelling argument that would resolve the conflict.

There is also an interpretive difficulty in determining whether an additional supporting reason introduced by a bridging term like 'besides' or 'moreover' or 'further' is a new argument or merely an independently relevant part of a single argument. This difficulty is best resolved by applying a moderate principle of charity, according to which an ambiguous text or discourse is to be disambiguated in the way that makes it more plausible.

The difference between independently relevant reasons in a single argument and multiple arguments for the same conclusion implies, as Freeman (2011, pp. 108–113) has pointed out, that the pragma-dialectical distinction between coordinatively compound argumentation and multiple argumentation is not the same as the linked-convergent distinction. Multiple argumentation involves distinct speech act complexes, in each of which one or more arguments are advanced in an attempt to justify a point of view–as it happens, the same one in each case. Coordinatively compound argumentation involves a single complex of speech acts in which more than one premiss is used in direct support of a point of view. From the pragma-dialectical perspective, the linked-convergent distinction is a distinction within the class of coordinatively compound argumentation. Snoeck Henkemans (1992, pp. 96–99), for example, recognizes two types of coordinatively compound argumentation, cumulative and complementary, which stand to each other roughly (but not exactly) as convergent arguments stand to linked arguments.

Beardsley and Thomas may have contributed to confusion between multiple arguments for a single conclusion and multiple independently relevant reasons in a single argument. Indeed, they may themselves have conflated these two concepts. They diagram convergent reasoning with a separate arrow from each independently relevant reason to the conclusion, thus giving the visual impression that there are distinct inferences to be evaluated but no need for a comprehensive assessment of how well the reasons taken together support the conclusion. Further, Beardsley refers to convergent reasoning as involving "independent reasons"—a phrase that could easily be read to cover independent arguments as well as independently relevant reasons in a single argument. Further, since Beardsley gives only two examples of convergent structures (one an argument from sign [1950, p. 18] and the other an [intuitively linked] argument for an evaluation [p. 21]) and makes nothing of the concept in his approach to evaluating arguments, it is hard to flesh out his ambiguous definition of a convergent argument as one in which "several independent reasons support the same conclusion" (p. 19). Beardsley in fact made less and less use of the concept of convergence in subsequent editions of his textbook; in the second (1956) edition it is merely mentioned at the beginning of a check-up

quiz, and it is missing from the third (1966) and fourth (1975) editions. It seems then that users of the first edition did not find its concept of convergence particularly useful. For his part, Thomas (1977, p. 39) conflates independently relevant reasons in a single argument with distinct arguments sharing a conclusion by counting as convergent reasoning not only independent reasons for some action but also separate alleged proofs of a single claim, such as different arguments for the existence of God.[2]

2.3 The Primary Sphere of the Distinction

To get a sense of the primary field of application of the linked-convergent distinction, we need to go beyond the intuitive distinction between premisses that work together and premiss-sets that constitute independently relevant reasons. We need to look at how the distinction is used, and in particular how the concept of convergent reasoning is applied. For this purpose, our most extensive and therefore best sources are the treatment of practical decision-making in the various editions of Thomas's textbook (1977, 1981, 1986, 1997) and the treatment of conductive reasoning in the various editions of Trudy Govier's textbook (Govier 1985, 1988, 1992, 1997, 2001, 2005, 2010).

In the last edition of his textbook (Thomas 1997), which presumably incorporates his most developed thinking on the topic, Thomas devotes 57 pages (385–441) to practical decision-making. He recommends a five-component approach to important personal decision-making situations:

1. Identify mutually exclusive options.
2. For each option, articulate whatever possible reasons pro and con one can think of.
3. Evaluate separately the acceptability and relevance of each such reason.
4. Consider reasons bearing on the acceptability or relevance of each reason (and reasons bearing on the acceptability or relevance of those reasons, and so on).
5. Pick the option that is best supported by its undefeated pro reasons and least opposed by its undefeated con reasons.

Diagramming these components is helpful, and perhaps even essential, for keeping track of one's reasoning. In diagramming the reasoning concerning each option, Thomas uses separate arrows for each reason—solid if it is a pro reason, dashed if it is a con reason (including a reason against the acceptability or relevance of another reason). He illustrates his recommended procedure with reference to two personal decision-making situations, described initially in the words of the

[2]This example disappears from the fourth (1997) edition of his textbook. A third type of example, in which a claim is supported both by evidence and by testimony, occurs only in the first two editions (1977, 1981) of his textbook.

decision-maker: a choice of living accommodation (pp. 395–404) and a choice of whether to move cities in order to get a better job in one's company (pp. 414–430).

We find a similar approach in Trudy Govier's treatment of what she calls "conductive arguments" (Govier 2010, p. 353), which she characterizes as "arguments in which premises are put forward as separately and non-conclusively relevant to support a conclusion, against which negatively relevant considerations may also be acknowledged" (2011, p. 262) and whose structure she describes as "always convergent" (2010, p. 352). Like Thomas, she proposes that one evaluate such arguments by considering for each premiss separately not only whether it is rationally acceptable but also whether it is relevant, positively or negatively, to the conclusion. After having done so, one should judge the strength of support given by each positively relevant rationally acceptable reason separately and by these reasons cumulatively, the strength of opposition given by each negatively relevant rationally acceptable counter-consideration separately and by these counter-considerations cumulatively, and the size of the difference between the cumulative support and the cumulative opposition (Govier 1999, p. 170, 2010, pp. 365–366). Govier illustrates this complex procedure with reference to an invented argument for legalizing voluntary euthanasia (Govier 2010, pp. 360–363).

Thomas and Govier have developed more extensively than any other authors a procedure for evaluating convergent reasoning and argument. Although their procedures differ and are illustrated by application to different types of arguments, they have an important commonality: separate judgment of the relevance to some conclusion of each of a number of diverse considerations, criteria, or signs. The point of distinguishing independently relevant, or putatively relevant, reasons pro and con in a convergent structure is thus to isolate them for separate consideration. If a given reason turns out to be unacceptable, questionable or irrelevant, it is still possible to estimate the strength of support that the remaining acceptable and relevant reasons give to the conclusion. The partitioning into distinct reasons is a necessary preliminary to this evaluative approach, but would generally not be helpful for evaluating other types of arguments, i.e. those that do not involve appeal to distinct considerations, criteria or signs.

The appropriate criterion for convergence, then, is the independent relevance to a conclusion of distinct sub-sets of an argument's premisses. Relevance in this sense is an ontic property, that of counting in context for or against the conclusion drawn. It is not a mental property of the person putting forward the argument, such as the arguer's intention or belief. Nor is it a property of the argumentative text, such as a claim or textual indication that the supporting reasons are being put forward as independently relevant. Convergence is thus primarily a feature of the way in which multiple coordinate premisses of a piece of reasoning or argument in fact work to support the conclusion. They do so convergently when and only when distinct sub-sets of the premisses adduce distinct considerations or criteria or signs that are in fact relevant, positively or negatively, to the conclusion drawn.

Although convergence is primarily a property of the support that multiple coordinate premisses provide to a conclusion, one can apply the concept derivatively to reasoning, arguments, premisses, reasons and argument structures.

Reasoning and argument are convergent when they have multiple coordinate premisses that can be partitioned into distinct sub-sets that it is plausible to interpret as put forward as independently relevant to the conclusion. In that case, the reasoning or argument can be said to have a convergent structure. The reasons constituted by such distinct sub-sets should then be treated as being put forward as convergent, i.e. as independently relevant to the conclusion, even if on evaluation not all of them turn out to be both rationally acceptable and relevant. If any such reason consists of a single premiss, then one can take that premiss to be put forward as convergent; otherwise, the concept of convergence should not be applied to the individual premisses.

Since convergence is primarily a way that a claim can be supported, there is judgment involved in deciding to treat a piece of reasoning or argument by the procedure appropriate to a convergent support structure. In cases where the reasons into which one partitions multiple coordinate premisses are not all rationally acceptable and relevant, the decision to partition may rest on syntactical considerations (e.g. a number of premisses attributing various characteristics to a common subject to which the conclusion attributes some further characteristic), semantic considerations (e.g. the status of the conclusion as a policy decision and the corresponding status of the distinct premiss-sets as diverse consequences or rules or deontic principles, or the status of the conclusion as a diagnosis and the corresponding status of the distinct premiss-sets as diverse signs or symptoms), textual considerations (e.g. the introduction of a subsequent premiss-set by the word 'besides'), and perhaps other sorts of considerations. Decisions to partition premisses based on such considerations are not correct or incorrect, but only more or less reasonable. Thus there may be no fact of the matter about whether a particular piece of reasoning or argument with multiple coordinate premisses is convergent, since the case for partitioning the premisses may be about as strong as the case against partitioning them. In this respect, the situation is exactly like that of deciding whether a piece of reasoning or argument is deductive, i.e. appropriately evaluated by the standard of deductive validity. The claim of the present paper that convergence is primarily a way in which a claim can be supported rather than primarily a type of argument is exactly parallel to my claim long ago that deduction is primarily a type of validity rather than a type of argument (Hitchcock 1979).

What about the concept of linkage? If we take linkage to be the complement of convergence, we can define it as support by multiple coordinate premisses in some way other than by distinct considerations or criteria or signs that are separately relevant, positively or negatively, to the conclusion drawn. As with convergence, we can derivatively define linked reasoning, arguments, premisses, and argument structures as those that it is appropriate to treat for evaluative purposes as linked. Judgment will be involved in making the decision about appropriateness.

This conception of linkage is purely negative. It implies nothing about the effect on the strength of support of finding that a premiss of an argument with linked support is questionable or unacceptable. And *a fortiori* it implies nothing about this effect in the case of an argument or reasoning that one decides, appropriately or not, to treat as linked for evaluative purposes. Thus, if we accept this conception of

linkage, we should regard as exercises in futility the many attempts in the literature to find a criterion for linkage in the consequences of "suspending" a premiss or finding it false: diminished support upon falsification (Thomas 1977, p. 38), no support upon falsification (Copi 1982, p. 21), insufficient support upon elimination (Snoeck Henkemans 1992), type reduction upon elimination (Vorobej 1994), and so forth. In any case, there is a useless spinning of wheels in applying any such test if the point of classifying an argument as linked is to facilitate evaluation, since one has to do the evaluation first in order to classify the argument in a way that indicates how one is to do the evaluation. Better just to do the evaluation and forget about the classification.

How then should we evaluate an argument that we decide to treat as if its support were linked? A straightforward way is to judge first the status of each premiss separately, in terms for example of whether it is acceptable, questionable or unacceptable. Then determine how strongly the premisses with their attributed statuses collectively support the conclusion and whether in context that degree of support is enough.

2.4 Conclusion

The linked-convergent distinction introduced by Thomas (1977) is not the same as the distinction between a single argument for a claim and multiple arguments for a claim. It is a distinction to be applied within the class of single arguments for a claim, specifically to such arguments with more than one premiss. It is primarily a distinction between ways in which two or more premisses in such an argument can directly support a claim. Support is convergent if the premisses can be partitioned into independently relevant reasons. Support is linked if the premisses cannot be partitioned into independently relevant reasons.[3] One can classify arguments, reasoning, premisses, or structures as linked or convergent only in a secondary or derivative sense, where what is involved is a judgment call on what type of support the author is most plausibly interpreted as attempting to provide by means of the argument, reasoning or component. Hence, as with the deductive-inductive distinction, there may be no fact of the matter as to whether a given multi-premiss argument is linked or convergent.

The value of the distinction lies in the consequences of treating an argument component as having convergent structure. Such a decision introduces into the evaluation of the premisses a consideration of the independent relevance of each premiss-set that is partitioned as a reason–a step that makes no sense if one is treating it as having linked structure.

[3] *Correction in the present republication*: I have deleted the phrase "that each consist of rationally acceptable premisses" from the end of this sentence, to make the linked-convergent distinction exhaustive within its field of application.

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Chapter 3
Postscript

Abstract The deductive-inductive distinction and the linked-convergent distinction apply primarily to support of conclusions by premisses. Such support is conclusive if and only if the argument has a true or otherwise acceptable covering generalization that supports counterfactual instances. Probabilification is only one type of non-conclusive support. To determine whether and how the premisses of an argument support its conclusion, it is best to make minimal changes and additions to the stated argument.

The second essay in this part was written almost 40 years after the first. Despite the lapse of time, the two essays have a common theme, that distinctions usually taken to apply to arguments (inductive vs. deductive, linked vs. convergent) in fact apply primarily to supports. It is a matter of judgment to decide for a given argument which type of support to demand of it, i.e. what is the appropriate standard of appraisal. In making this judgment, various criteria are relevant: the situation in which the argument is put forward, the purpose for which the author advances it, the author's claims or intentions or beliefs about the degree and nature of the support provided for the argument's conclusion, the syntactic form of the argument, the semantics of key phrases, the purpose(s) of one's appraisal, and so forth.

Although introductory textbooks still take these distinctions to apply primarily to arguments, with varying criteria for such an application, some scholars have endorsed my position, notably Ennis (2001) and Goddu (2001). Ennis calls for a comprehensive strategy of argument appraisal that involves a successive application of deductive, inductive and other standards. Goddu argues that it is unnecessary for purposes of analysis and appraisal to classify arguments as deductive or inductive. It is enough, he holds, to distinguish degrees of support. The task of an argument's evaluator is to determine whether the argument's premisses support its conclusion to the degree that the context requires. Goddu even rejects the idea of classifying arguments derivatively as deductive or inductive on the basis of which standard of appraisal is appropriate, since one and the same argument may need to provide deductive support in one context but not in another. His argument implies that the determination of which standard of appraisal is appropriate to a given argument

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must apply to a token argument in a particular situation, not to an argument-type abstracted from any context.

A subsidiary question concerns the types of support that an argument's premisses can provide. The view that all good reasoning is either deductive or inductive goes back almost 2400 years to Aristotle, who wrote in his *Topics* (105a10-12) that there are two species of dialectical arguments, induction and deduction.[1] Aristotle defines induction there as a passage from particulars to universals—typically in his examples from the sharing of a characteristic by coordinate species to its possession by their common genus. This definition is narrower than contemporary definitions of induction. Likewise, Aristotle's definition in the same work of a deduction as "an argument in which, certain things being laid down, something other than these necessarily comes about through them" (100a25-27) adds to the usual condition that the argument's conclusion follows necessarily two or three further requirements: that there is more than one premiss, that the conclusion is different from any premiss, and (on some interpretations) that the argument has no redundant premiss. His limitation of dialectical arguments to inductions and deductions implies that they are all inferentially sound, even though he recognizes in his *Sophistical Refutations* (which is in effect Book IX of his *Topics*) that there can be misreasoning (*paralogismos*) in the question-and-answer discussions that are the subject-matter of the *Topics*; for example, the questioner may draw from the answerer's admissions a conclusion by illegitimately trading on an ambiguity in them. Further, Aristotle recognizes elsewhere that there are other forms of reasoning than deduction and induction: arguments from likeness (*Topics* 156b10-17), deliberation on how to achieve a desired end (*Nicomachean Ethics* 1112b12-1113a2), quasi-deductions from probabilities or signs (*Prior Analytics* 70a3-b38, *Rhetoric* 1357a23-b27), and examples (*Rhetoric* 1356b1-25). The latter two forms are the rhetorical counterparts of the deductions and inductions of dialectic.

Since Aristotle, logicians have distinguished many more forms of reasoning. Walton et al. (2008, pp. 308–346) describe 60 main "argumentation schemes". These schemes, however, cut across the distinction between conclusive and non-conclusive support. For example, observation of a uniform value of some variable among some members of a class can support either conclusively or non-conclusively attribution of that value to all members of the class. Support is conclusive where the variable is known to have a uniform value within the class (e.g. the specific gravity of a chemical compound), but non-conclusive otherwise. Similarly, arguments by analogy can support their conclusions either conclusively or non-conclusively. So can appeals to considerations, criteria or signs, as even Aristotle recognized (*Rhetoric* 1357b1-21).

The key distinction among types of support is the distinction between conclusive and non-conclusive support. Support is conclusive if and only if the conclusion follows necessarily from the premisses, and is non-conclusive if and only if the

[1] In citing Aristotle, I use the translations in (Aristotle 1984 [4th century BCE]).

conclusion gets some support from the premisses but further information compatible with the premisses can show that the conclusion is unacceptable. It is misleading to label these two types of support "deductive support" and "inductive support". Conclusive support can be provided in virtue of any true covering generalization of an argument that holds for counterfactual instances, even a generalization that has substantive content. That sodium chloride (table salt) has a specific gravity of 2.16 follows necessarily from a finding of that specific gravity in a single sample of pure sodium chloride, in virtue of the true law-like covering generalization that any sample of pure sodium chloride has the same specific gravity as sodium chloride in general does. Support here is just as conclusive as in the formally valid and semantically valid arguments to which we usually restrict the concept of deductive support.

Likewise, the concept of inductive support is usually understood more narrowly than the concept of non-conclusive support. Induction is sometimes understood as narrowly as Aristotle understood it, as generalization from instances. Some people take it to include support of a hypothesis by the positive result of an experiment or systematic observation, a form of reasoning also called 'abduction'. But very few extend it to reasoning about what to do where the support is non-conclusive, e.g. in means-end reasoning or in decision-making based on "weighing up" the pros and cons.

Conclusive support is necessitation. It is tempting to refer to non-conclusive support correspondingly as probabilification. But that label is misleading too, because it suggests a uniform probabilistic approach to inference evaluation, such as some sort of Bayesianism. Such a probabilistic approach is often inappropriate or even impossible. In deciding what to do, for example, it makes little sense to assign a prior probability to a decision independently of the factors that have led one to it.

In a number of respects,[2] I would now modify what I wrote 36 years ago in Chap. 1 ("Deduction, induction and conduction").

First, I classified inductive strength as a type of validity or a standard of validity. The word 'validity' gives the misleading impression that inductive strength is an on-off property, like deductive validity. I would now prefer to classify inductive strength as a type of support or a standard of appraisal. The word 'strength' clearly indicates that the support in question is a matter of degree.

Second, I took an argument to be cogent for somebody, in the sense of giving that person adequate grounds for believing or doing what its conclusion says, when and only when (l) that person has justifications which are independent of the conclusion for accepting its premisses and (2) the conclusion follows from the premisses. The second clause needs to be relativized to the person in a way analogous to the first, for example by rewriting it as "that person is justified in accepting that the conclusion follows from the premisses" or (better) as "that person is justified in accepting that the premisses if true provide sufficient support for the conclusion". Relativity to the person means that an argument can be not cogent for

[2]I thank Derek Allen for drawing three of these respects to my attention.

a person even if the person is justified in accepting the premisses and the conclusion follows from (or is sufficiently supported by) the premisses, for example if the person has no justification for accepting that the conclusion follows from (or is sufficiently supported by) the premisses. Conversely, an argument can be cogent for a person even if its conclusion does not follow from (or is not sufficiently supported by) the premisses, namely if the person is justified in accepting that it follows (or is sufficiently supported). Even with relativization, the account of cogency now seems to me too atomistic. For one thing, justification comes in degrees, and the degree of justification that is adequate will depend on various factors in the situation, such as the effect on the person's well-being of erroneous acceptance or erroneous non-acceptance of the conclusion. For another, an argument's justification of its conclusion can be overridden by other information casting doubt on one of its premisses, by the general untrustworthiness of the argument's author, by other relevant arguments of which the author is aware, and so on.

Third, I wrote, "An argument is deductively valid if and only if the truth of its premisses guarantees the truth of its conclusion; that is, it is impossible for the premisses to be true and the conclusion false." In later work (Hitchcock 1998, reprinted as Chap. 5 of the present volume), I objected to the conception of logical consequence as a relation in which it is impossible for there to be true premisses and a false conclusion that it gives rise to two paradoxes, (1) that anything at all follows logically from logically impossible premisses and (2) that a logically necessary sentence follows logically from anything at all. My present inclination is to take logical consequence, or following logically, in the narrower sense of Chap. 5, in that the words 'consequence' and 'following' indicate that the thing that follows in some sense comes out of what it follows from. It just seems odd to say that 'Tom is in the corner' follows logically from 'you are sitting and you are not sitting' (to take a medieval example). So I would now be inclined to modify the definition of deductive validity in Chap. 1 accordingly. There may however be a place in theoretical work for an unqualified notion of the logical impossibility of true premisses and a false conclusion; we might call this broader property 'inferential irrefutability'.

Fourth, I would now modify the definition of deductive validity in two other respects. I would remove the clause about guaranteeing the truth of the conclusion, since the word 'guarantee' connotes a kind of assurance that many deductively valid arguments do not provide, for example all arguments whose conclusion merely repeats its premiss. And I would replace the word 'false' with the word 'untrue', to accommodate the possibility of showing deductive invalidity by describing a possible situation in which the premisses are true but the conclusion is neither true nor false.

Also in Chap. 1 I freely attributed unstated premisses in the process of putting a quoted argument into standard form. I now think that such liberal attributions of unstated premisses are highly questionable, since they may easily be more questionable than what the argument requires or the author accepts. It is better to follow a very conservative practice of sticking to the author's actual words, making revisions only to the extent necessary for one's purposes and justifiable by the

context of those words. In most cases, one can ask directly how well the stated premisses support the stated conclusion, without extensive massaging of the discourse or text. Take for example the short passage quoted in Chap. 1 (page 14) from the *Reader's Digest*:

> (1) Don't drink if you're pregnant. According to Dr. Joseph R. Cruse of the University of Southern California, women drinking any alcohol at all may run a risk of irreparable damage to their unborn babies …

A conservative reconstruction of this argument would simply put the premiss first, just as stated, and would follow it with the conclusion, introduced by the word 'therefore', and modified only to flesh out the word 'drink' in the manner indicated by the second sentence:

> (2) According to Dr. Joseph R. Cruse of the University of Southern California, women drinking any alcohol at all may run a risk of irreparable damage to their unborn babies … Therefore, don't drink any alcohol at all if you're pregnant.

According to the approach to inference evaluation articulated in the chapters of the next part of this book, the conclusion of this argument follows if and only if it has a true or otherwise acceptable covering generalization that supports counterfactual instances. Any such covering generalization must generalize over at least one content expression that occurs both in a premiss and in the conclusion. In the present case, there is one such repeated content expression: 'drink any alcohol at all'. If we generalize with respect to this repeated content expression over the argument's associated material conditional, and put the result into somewhat standard English, we get the following candidate for an inference-licensing assumption:

> If you're pregnant, don't do anything that, according to Dr. Joseph R. Cruse of the University of Southern California, may run a risk of irreparable damage to the unborn babies of women who do it.

There are two obvious evaluative questions to ask about this assumption. What is Cruse's authority and evidential basis for making a claim about a possible risk of irreparable damage to a pregnant woman's unborn baby? Is it a reasonable demand that a pregnant woman refrain from any activity that poses a merely possible risk of unspecified magnitude of irreparable damage of unspecified seriousness to her unborn child, regardless of the other consequences of giving up this activity? The latter question suggests some restriction of the principle to activities that on the one hand pose a substantial risk of serious harm to the unborn child and on the other hand can be given up for the duration of the pregnancy without serious adverse consequences for anybody. A reasonable response to the brief snippet in the *Reader's Digest* is that the conclusion needs more support, on the one hand from information about Cruse's standing for making his claim and on the other hand from information about the probability and nature of the damage to an unborn child if its mother drinks alcohol to a specified extent.

The approach to argument analysis and evaluation illustrated by the discussion of this example puts most of the weight on the evaluation stage. It avoids tendentious attribution of assumptions at the analysis stage.

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Part II
Material Consequence

Chapter 4
Enthymematic Arguments

Abstract Enthymematic arguments are arguments appropriately appraised by a deductive standard whose premiss or premisses are partially topically relevant to their conclusion. The author of an enthymematic argument implicitly assumes the truth of a universal generalization of the argument's associated conditional with respect to one or more content expressions which occur more than once. Unless it would be implausible, where a molecular content expression is repeated, this generalization is over the most molecular repeated content expression. If more than one distinct content expression is repeated, this generalization is over all such distinct content expressions except those over which it would be implausible to generalize. Unless the context of utterance of the argument or considerations of plausibility indicate a restriction, the generalization is over the entire category of items within which the content expression's *significatum* occurs. This assumption is better regarded as a non-formal rule of inference than as a missing premiss. If it has exceptions, the argument is not enthymematically valid. Interpreters of philosophical arguments supplement them with such premisses for purposes other than evaluation: to understand why the author drew the conclusion, to strengthen the argument, to get support for their own position, or to discredit the argument.

A recurrent theme in theoretical treatments of argument—such as those of Perelman and Olbrechts-Tyteca (1971/1958, pp. 83–99), Toulmin (1958, pp. 98, 100), Hamblin (1970, pp. 235, 238, 245) and van Eemeren and Grootendorst (1984, pp. 119–149)—is the tendency of most arguers to leave implicit an assumption in virtue of which their conclusion follows from their premisses. Outside carefully articulated philosophical and mathematical reasoning, in fact, most arguments are deductively invalid in the

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sense that the meaning of their constituent statements leaves open the possibility that their premisses are true and their conclusion false. Some of these deductively invalid arguments are appropriately appraised by a non-deductive standard of inference appraisal; they are "inductive" or "conductive" or "abductive" arguments. Some are obvious non sequiturs, to be rejected out of hand. The rest are the topic of this paper.

These arguments, then, are deductively invalid, but not mere non sequiturs and not non-deductive arguments either. Let us call them "enthymemes" or enthymematic arguments, after the name borrowed from Aristotle in traditional "Aristotelian" logic for syllogisms in which a premiss (or the conclusion—but I exclude such cases) is omitted.

Two problems arise about such arguments. The **demarcation problem** is to distinguish enthymemes from deductively valid arguments on the one hand and mere non sequiturs on the other. (I assume for the sake of this discussion that there is some way of separating off arguments whose inference is appropriately appraised by a non-deductive standard, and I ignore any problem of "missing premisses" which may arise among such arguments.) The **evaluation problem** is to work out how to evaluate the inference in an enthymematic argument.

Although enthymemes are common and their recognition goes back at least to Aristotle (*Rhetoric* I 2 1357a17–19), there is at present no adequate solution to these two problems. To be sure, traditional logic, as represented by such authors as Barker (1965) and Copi (1982), has solved them for incomplete categorical syllogisms, and Duthie (1974) has extended these solutions to a broader logic of terms. And George (1972, 1983) has, though I believe with insufficient supporting argument, supplied solutions for propositional logic and first-order predicate logic. But there is no extant general solution for either problem. It is not an adequate solution to the demarcation problem, for example, to say that an enthymeme is an argument with a missing premiss, for we need criteria for determining when a premiss is missing. Besides, some authorities (Bolzano 1972/1837; Ryle 1954; Toulmin 1958; George 1972, 1983) deny that enthymemes have missing premisses, and I shall later defend this denial. Nor is it an adequate solution to the evaluation problem to say, as Govier does, that you add a missing premiss whose addition "you can justify … with reference to the wording and context that is actually there" (Govier 1985, p. 33) and evaluate the resulting argument. For we need criteria for an adequate justification of the additional premiss on the basis of the original argument's wording and context.

I intend, therefore, to propose and defend a general solution for natural languages of these two problems.

4.1 Deductive Validity in Natural Languages

The first step in distinguishing enthymemes from deductively valid arguments on the one hand and mere non sequiturs on the other will be to define deductive validity for natural languages. The concept of deductive validity is well defined

within formal systems constructed using the logistic method (Church 1956, pp. 47–58). An argument expressed in a formal system **K** is syntactically valid if and only if it is provable within **K** that its conclusion is a consequence of its premisses. And the argument is semantically valid under a specified interpretation of the system's connectives and operators if and only if no assignment of values to the argument's constants makes its premisses true and its conclusion false under the specified interpretation of the connectives and operators.

One could therefore define deductive validity for arguments in natural languages with reference to deductive validity within a formal system. On such an approach, a deductively valid argument in a natural language would be an argument which is correctly translated into an argument which is semantically valid in a formal system with a specified interpretation of its connectives and operators. Given the difficulties of such translation, however, and the probable need for as yet undeveloped formal systems, it seems appropriate to advance a conception of deductive validity which can be applied directly to arguments in natural languages Such a conception would have to be a semantic rather than a syntactic one, since natural languages do not come equipped with a complete set of primitive syntactically expressed rules for deductively valid inference.

The constants in formal systems are the analogues of what we might call atomic content expressions in natural languages. Such expressions, the categorematic terms of medieval logic, can be regarded as referring to or otherwise signifying actual or possible features of the universe: entities, qualities, occurrent states, dispositions, events, relationships, times, places, facts, and so forth. Natural languages thus have a built-in apparent categorial scheme, which could in principle be made explicit. (Revisionary ontologists can reject such apparent categorial schemes by providing functionally equivalent paraphrases into a canonical notation, in the fashion of Quine, or by producing some other account of how language relates to reality.) **Content expressions** can be defined in terms of this apparent categorial scheme as expressions which in the context of their utterance can be regarded as referring to or otherwise signifying an item in a category. A **molecular content expression** is a content expression which has as a proper part an expression which is a content expression. An **atomic content expression** is a content expression which is not molecular.

From a given sentence, it is possible to construct a sentence of the same **form** by substituting for one or more of the content expressions a content expression in the same category. (I originally introduced the term "category" for categories of items; by extension, one can speak of the category to which belongs an expression signifying an item in a category Thus, the sentence "The dog is on the mat" is of the same form as the sentence "The cat is on the mat", because it can be obtained from that sentence by substituting "dog" for "cat". Let us define **substitution on a content expression** as "replacement of that content expression by a content expression in the same category". (We allow as a degenerate case substitution of a content expression by itself.) Further, by **uniform substitution on a content expression** let us mean "replacement of all occurrences of a content expression by the same content expression, one in the same category as the original." (It is to be

understood that the expression has the same meaning at all occurrences; where the expression has different meanings at different occurrences, we treat these as occurrences of different content expressions.) The **atomic form** of a sentence (or set of sentences) can be regarded either as the set of sentences (or of sets of sentences) obtained by uniform substitution on all the atomic content expressions in the original sentence (or set of sentences) or as a schema which each member of the set instantiates.

An argument which is formally deductively valid is one whose (atomic) form makes it impossible for its premisses to be true and its conclusion false. We can give some precision to the notion of an argument's form making something impossible, in the following way: An argument is **formally deductively valid** if and only if no uniform substitution on the argument's atomic content expressions produces an argument with true premisses and a false conclusion.

It may be objected that an attempt like this to define formal deductive validity for natural languages is bound to fail, because at least some natural languages have grammars which are not logically perspicuous, in the sense that sentences of the same grammatical form have different logical forms. Thus, for example, there follows from the premisses that "That dog is mine" and "That dog is a spaniel" the conclusion that "That dog is my spaniel", but from the premisses that "That dog is mine" and "That dog is a father". It does not follow that "That dog is my father". (Cf. Plato's *Euthydemus* 298d–e.) In general, however, such apparent counterexamples to the definition involve the substitution of a content expression of a different category; in the example, "spaniel" signifies a kind of entity but "father" a relationship.

The proposed definition of formal deductive validity has at least two virtues, in addition to its immediate applicability to natural languages. First, it brings out the attraction of formal deductive validity as a criterion of appraisal for arguments: it is truth-preserving. The conclusion of any formally valid argument with true premisses will also be true. In cases where the premisses are not known with certainty to be true, but merely accepted as true on the basis of more or less adequate evidence or argument, the argument does not give us certain knowledge of the truth of the conclusion, but provides some basis for transferring the acceptance we give to the premisses to the conclusion (subject to countervailing considerations from other evidence and arguments). Since one function of arguments is to increase our stock of truths, or at least of well-grounded beliefs, formal validity is a sufficient criterion of inference soundness.

Secondly, it provides a quick way of showing that an argument is formally invalid. One simply constructs a parallel argument, obtained by substitution on the original argument's atomic content expressions, in which the premisses are true and the conclusion false. (Let us call such a parallel argument a **counterexample** to the original argument.) Suppose, for example, someone argues that nuclear weapons have prevented a war between the superpowers, on the ground that there has not been a war between the superpowers since they both got nuclear weapons. The conclusion does not necessarily follow, one might reply: You might as well say that new cars have prevented a fight between the neighbours, on the ground that there

has not been a fight between the neighbours since they both got new cars. It is more difficult to demonstrate formal validity using the proposed definition as a criterion, since the failure to produce a counterexample may be due to lack of imagination or ingenuity rather than to the absence of a counterexample.

I have advanced the proposed definition as a definition of formal deductive validity, rather than of deductive validity in general, in order to allow for arguments which are deductively valid in virtue not only of their form but also of meaning relations among their atomic content expressions. The argument, "Today is Monday, because yesterday was Sunday," for example, is deductively valid in the sense that the meanings of the premiss and the conclusion make it impossible for the premiss to be true and the conclusion false, but its validity rests partly on the meaning relations between "today" and "yesterday" on the one hand and between "Monday" and "Sunday" on the other hand. Such arguments can always be made formally deductively valid by adding premisses which are true by definition; in the example, we might add the premisses that yesterday is the day before today, Sunday is the day before Monday, and the days before identical days are identical days. Since the converse proposition is also true (any argument is deductively valid which can be made formally deductively valid by adding definitionally true premisses), we can define a **deductively valid argument** as an argument which is either formally deductively valid or can be made so by the addition of one or more definitionally true premisses.

4.2 Distinguishing Enthymemes from *Non Sequiturs*

Having separated off non-deductive arguments and deductively valid arguments, how are we to distinguish within the rest between enthymemes and mere non sequiturs? A tempting approach is to regard the enthymemes as the arguments among this set whose authors have omitted one or more premisses. That is, the question would be whether the arguer had an additional premiss in mind, but left it unstated, for example because she took it to be common knowledge (see again Aristotle's *Rhetoric* I 2 1357a17–19 [Aristotelis 1959]) or because she wished to protect it from unwelcome criticism. We should reject this approach, for two reasons. First, we are often not in a position to question the arguer about whether she had another premiss in mind, and so must fall back on textual rather than psychological criteria, which will need to be supplied. Second, and more importantly, authors of acknowledged enthymemes often have no additional premiss in mind. To take an everyday autobiographical example, I recently reasoned that it would not be difficult to find a house in a nearby city for which I had been given directions, because the house was just off the main road. This simple piece of reasoning is obviously an enthymematic argument, but I was not conscious of having omitted a premiss in articulating it—especially since I articulated it to myself before later verbalizing it to someone else. I invite the reader to try the same exercise with her or his own recently formulated enthymematic argument; I doubt

that you will be conscious of having omitted a premiss. This fact, which supports the view that enthymemes do not have missing premisses, obviously makes it impossible to identify enthymemes as arguments whose authors omitted a premiss.

A second tempting strategy is to limit enthymemes to arguments which can be made deductively valid by adding a premiss. This "limitation", however, is no limitation at all, for any argument can be made deductively valid by adding as a premiss the statement that, if the premisses are true, the conclusion is true. Let us call this statement the argument's **associated conditional**. It is the conditional statement whose antecedent is the conjunction of the argument's explicit premisses and whose consequent is the argument's conclusion. This conditional statement can be regarded, in fact, as making explicit at least part of the claim which the arguer implicitly makes in inferring the conclusion from the premiss(es). To infer a conclusion from given premiss(es) is to assume that the conclusion follows from the premiss(es), and the conditional statement articulates this assumption.

An unwelcome consequence of the strategy of regarding an argument as an enthymeme if it can be made deductively valid by adding a premiss is that arguments whose premisses have no connection to their conclusion turn out to be enthymemes. "Two plus two equals four, so Ulan Bator is the capital of Outer Mongolia," for example, would be an enthymeme, since it can be made deductively valid by adding the premiss, "If two plus two equals four, then Ulan Bator is the Capital of Outer Mongolia." On a truth-functional interpretation of the conditional, of course, this added statement is true, and so the expanded argument turns out to be formally valid and have true premisses. But the only way of showing that the assumption is true is to show that its consequent (i.e. the conclusion of the original argument) is true, so that the expanded argument is question-begging. So the argument is not a good one. Rather than going through such an involved discussion, we might prefer simply to say that the conclusion does not follow, that the argument is a mere non sequitur. But how are we to distinguish such non sequiturs from enthymemes?

Our example indicates that an argument is a non sequitur if its associated conditional can only be shown to be true by showing that the conclusion is true. This condition obtains when the argument's premisses are irrelevant to its conclusion. An obvious form of such irrelevance is the absence of any connection in meaning between the premisses and the conclusion. Such a meaning connection is absent when there is no content expression common to a premiss and the conclusion, even implicitly. The presence of a common content expression, or the ability to produce a common content expression by making definitionally equivalent substitutions, would make the premiss(es) relevant to the conclusion in this sense. Let us call this sense of relevance **topical relevance** of the premiss(es) to the conclusion.

We might also be tempted to regard an argument as a non sequitur when its premiss is irrelevant to its conclusion in a more substantive sense. That is, there is a common content expression, but the premisses don't seem to provide any support for the conclusion. Suppose someone argues that Samantha is trustworthy because she has red hair. What does having red hair have to do with being trustworthy, we

might respond. The premiss is irrelevant, and the conclusion just does not follow. Although this reaction is natural and ultimately defensible, I prefer to count such arguments as enthymemes and to rest the judgment of their inadequacy on a substantive verdict about the falsehood of the implicit assumption in virtue of which their conclusion follows from their premiss(es). My reason for doing so is that irrelevance is a slippery concept, easy to misuse as a term of apparent logical criticism, and I would prefer to confine its application to cases where the criteria are clear and genuinely logical. We should beware of theories of argument which disguise substantive objections to claims and arguments in terminology which sounds purely logical.

We also want to count as non sequiturs formal fallacies, such as affirming the consequent and denying the antecedent. The problem with such arguments is that their premisses are **too** topically relevant to their conclusions. That is, every content expression occurs at least twice. To explain why excessive topical relevance is a problem, I need to anticipate the results of the second section of this paper. There I shall argue that an enthymeme implicitly assumes a universal generalization of its associated conditional over its repeated content expressions, in fact the maximal generalization consistent with plausibility. Since a formal fallacy is by definition invalid and contains no unrepeated content expressions, the maximal generalization of its associated conditional will be a purely formal principle which is a logical falsehood. Suppose, for example, that someone argues that Charles works with graphite on the ground that he has black stains on his hands which people who work with graphite have. The maximal universal generalization of this argument's associated conditional is that any entity has a property if that entity has another property and any entity with the first property has the second property. (For any x, F and G, x is F if x is G and whatever has F has G.) Less maximal generalizations, admittedly, might have some plausibility. It might be that any individual works with graphite if that individual has black stains on his hands and everyone who works with graphite has black stains on his hands. I confess that I do not know how to respond to this problem. If pressed, 1 would allow formal fallacies as enthymemes and evaluate them on the basis of the implicit assumption in virtue of which the conclusion follows from their premisses.

One way of rejecting some formal fallacies as non sequiturs is to point out that their associated conditional, if added as a premiss, would make an existing premiss redundant. Thus the conclusion cannot be made to follow deductively from the whole set of original premisses. I once thought this fact made such arguments non sequiturs, but have abandoned this view, for three reasons. First, since deductively valid arguments with redundant premisses are still deductively valid, why shouldn't enthymemes with redundant premisses still be enthymemes? Second, the alleged redundancy of an existing premiss depends on the controversial truth-functional interpretation of the conditional. Third, this criterion does not rule out all formal fallacies as non sequiturs. For example, if we add as a premiss the conditional associated with the argument in the preceding paragraph that Charles works with graphite, none of the original premisses becomes redundant.

I conclude that enthymemes differ from non sequiturs in that their premisses are partially topically relevant to their conclusions. That is, at least one content expression occurs, perhaps implicitly, in both the premisses and the conclusion. And at least one content expression occurs only once. The reader will be able to think of apparent enthymemes which do not appear to meet this criterion of partial topical relevance. Suppose someone says, "It is cold, so I should put on my coat." (I owe the counterexample to Ennis.) We would count this argument as an enthymeme, but there is no common content expression, even if we substitute definitionally equivalent sentences for the premiss and conclusion. There is, however, a temporal adverb "now" implicit in the present tense of both verbs. This adverb can be regarded as the repeated content expression, and thus the argument is an enthymeme after all.

An awkward consequence of this extension of the criterion of partial topical relevance is that some arguments which were excluded as non sequiturs come back into the class of enthymemes. We can still keep out the argument from a truth of arithmetic to a truth of geography, since truths of arithmetic do not come with an implicit temporal adverb. But an argument, for example, that Washington is the capital of the United States because Ulan Bator is the capital of Outer Mongolia will have to count as an enthymeme. The inadequacy of such an argument will have to rest on the inadequacy of the implicit assumption in virtue of which its conclusion follows from its premiss.

4.3 The Universal Generalization Thesis

The standard approach to evaluating the inference in an enthymematic argument is to identify and evaluate the implicit assumption in virtue of which the conclusion follows from the premiss(es); if it is true, the enthymematic inference is valid, but if false, invalid. A variant allows an enthymematic inference to be invalid where the implicit assumption is true but insufficient to make the original argument deductively valid if it is added as a premiss. The standard approach typically regards the implicit assumption as an unexpressed, missing, unstated, tacit or even suppressed premiss of the enthymematic argument; for examples of each term, see respectively van Eemeren and Grootendorst (1984), Govier (1985), Scriven (1976), Hitchcock (1983) and Thomas (1981). I shall argue later that the implicit assumption is better regarded as a non-formal rule of inference, but nothing in what immediately follows depends on this position.

Since our purpose is evaluation, we should look for an assumption on which the argument depends, regardless of whether the arguer had such an assumption in mind, rather than an assumption the author had in mind, which may be neither necessary nor sufficient for the conclusion's following from the premiss(es). Ennis (1982) used the terms "needed assumption" and "used assumption" for these two

types. I propose instead to use the terms "argument's assumption" and "arguer's assumption", for two reasons. First, as Ennis holds and I am about to argue, an enthymematic argument assumes more than is strictly needed to make the conclusion follow from the premiss(es). Second, an arguer uses the argument's assumption in drawing a conclusion, even if she is not aware of having done so. So in what follows we are looking for a general characterization of the assumption of an enthymematic argument which is implicit in inferring its conclusion from its premiss(es). I call the assumption "implicit" rather than "unstated" because "unstated" suggests something the arguer had in mind.

An enthymematic argument, we have seen, assumes at least the truth of the argument's associated conditional. But, I suggest, it assumes more. Consider the argument, "Depo-Provera is safe, because it is an effective contraceptive." At the time of writing, this argument's premiss was accepted as true, but its conclusion was controversial. Suppose, however, that the conclusion is true. On a truth-functional interpretation of the conditional, the associated conditional "If DepoProvera is an effective contraceptive, then Depo-Provera is safe" is true. Other interpretations of the conditional either make the associated conditional true or require us to determine whether the consequent follows from the antecedent, which is the question we are trying to answer. So, if we take the argument to be assuming only the truth of the associated conditional, we are driven to say either that the conclusion follows or that we are in the dark as to whether it does. But in fact we know that it does not follow, that the argument is a bad one. The mere fact that something is an effective contraceptive, we might say, does not show that it is safe. We might even be able to cite an example of another drug which is an effective contraceptive but is not safe, say the Dalkon Shield. These responses are irrelevant if an enthymeme assumes only its associated conditional. They are relevant, and conclusive, if an enthymeme assumes a universal generalization of its associated conditional with respect to at least one repeated content expression. Let us call the thesis that an enthymematic argument implicitly assumes the truth of a universal generalization of its associated conditional with respect to at least one repeated content expression **the universal generalization thesis**.

The thesis just mentioned is equivalent to supposing that one can object to an enthymematic argument by producing a parallel argument with true premiss(es) and a false conclusion, obtained from the original by uniform substitution on one or more repeated content expressions. If we think it legitimate to respond, "You might as well say that the Dalkon Shield is safe because it is an effective contraceptive", where it is known that the Dalkon Shield is an effective contraceptive but not safe, then we accept the universal generalization thesis, at least for this argument.

The above remarks do not prove the universal generalization thesis. They do, however, make it plausible. My strategy in what follows will be to make it more plausible by showing that the implicit assumption produced by the application of the thesis conforms tolerably well to our intuitive judgments, as well as to the theory of enthymemes in traditional logic, and that there are good explanations for its divergence from our intuitions.

4.4 Confirmation of the Universal Generalization Thesis

Consider first an argument of a common type, in which premiss and conclusion have the same grammatical subject but different grammatical predicates. The logician's favourite example is the sentence, "Socrates is a man, so Socrates is mortal." The universal generalization of this argument's associated conditional is the sentence, "For any x, if x is a man, x is mortal," or in standard English, "Every man is mortal." According to the universal generalization thesis, this is the only possible implicit assumption of the argument, since "Socrates" is the only content expression which occurs more than once in the associated conditional. Thus, we can conclude that someone who advances the argument, "Socrates is a man, so Socrates is mortal," is committed to the proposition that every man is mortal. And this is what we intuitively think.

There are arguments where we intuitively think that the implicit assumption is a particular statement. For example, we would suppose that someone who argues, "Depo-Provera is safe because any drug is safe which has been approved at all levels of the drug testing procedure in the United States", is implicitly assuming that Depo-Provera has been approved at all levels of the drug testing procedure in the United States. Since the universal generalization thesis holds that the implicit assumption is always a universal generalization, our intuitive judgments about these arguments might seem to conflict with the thesis. But, surprisingly, in cases of this kind the universal generalization in question is equivalent to a particular statement. In abbreviated form, the associated conditional of the above argument is the sentence, "If any consistently approved drug is safe, then Depo-Provera is safe." Its universal generalization is the sentence, "For any F, if any consistently approved drug is F, then Depo-Provera is F," or, in somewhat more standard English, "Depo-Provera has every property which every consistently approved drug has." But this sentence is equivalent to the sentence, "Depo-Provera is a consistently approved drug" We can demonstrate this equivalence by deducing each sentence from the other. One property which every consistently approved drug has is that it is a consistently approved drug. So, if DepoProvera has every property which every consistently approved drug has, then it is a consistently approved drug. But, conversely, if it is a consistently approved drug, then it will have every property that every consistently approved drug has, since it is one of the consistently approved drugs.

Consider next an enthymeme of the kind recognized by traditional logic, that is, an argument which can be filled out so as to become a two-premiss syllogism in one of the moods recognized as valid by the Aristotelian tradition. Consider the argument, "No man has feathers, so no man is a bird." Since just one content expression, "man", appears in the associated conditional, "If no man has feathers, then no man is a bird," the universal generalization thesis implies that the implicit assumption of this argument is the sentence, "For any F, if no F has feathers, then no F is a bird," that is, "Any non-feathered thing is not a bird," or, contraposing, "Every bird has feathers," This is exactly the assumption which "traditional logic" would supply on

the basis of its recognition of the argument as an incomplete second-figure assertoric syllogism. As can be verified by complete enumeration, this coincidence of results obtains for all incomplete assertoric syllogisms.

We find the same coincidence of results for arguments which we would intuitively recognize as incomplete instances of arguments deductively valid in virtue of the sentence-forming expressions "not," "and," "or" and "if". Consider, for example, the argument. "John is asleep, because he's asleep when the television is off." We would intuitively recognize an incomplete *modus ponens* argument of the form, "lf p then q, and p, so q." The implicit assumption is intuitively that the television is off. The argument's associated conditional is the sentence, "John is asleep, provided that, if the television is off, he's asleep." Here the universal generalization thesis allows us to generalize on the words "John" or "asleep," but, as I shall argue later, we are entitled to generalize on the molecular content expression, "John is asleep." The resulting sentence is, "For any p, p, provided that, if the television set is off, p," or, in slightly more standard English, "Any proposition at all is true if this proposition follows from the proposition that the television set is off." But this sentence is equivalent to the proposition that the television set is off. (The equivalence can be demonstrated by assuming each sentence in turn and proving the other on its basis. To prove the particular statement, instantiate the generalization with the sentence "The television set is off" and detach the logically true antecedent, "If the television set is off, the television set is off." To prove the universally generalized conditional, assume its antecedent for an arbitrary sentence q and use the particular statement to detach the antecedent of this antecedent, thus deriving the consequent of the larger conditional; then conditionalize and generalize over q.)

Similar coincidences of results between our intuitive judgments and the application of the universal generalization thesis apply to other incomplete examples of forms of argument which are deductively valid in virtue of the meanings of "not," "and," "or" and "if."

For some arguments, however, the universal generalization thesis gives a result different from our intuitions. As far as I have been able to determine, the intuitively supplied assumption is either a stronger assumption from which we can deduce the universal generalization of the associated conditional or a weaker assumption which can be deduced from the universal generalization of the associated conditional. An example of the first type of discrepancy, supplied by Mary Richardson, occurs with the enthymematic argument, "x and y have started wars, so some generals have started wars." We would intuitively suppose that this argument assumes that x and y are generals. The universal generalization of the associated conditional-that some generals have every property which x and y have-is a weaker statement which follows from the intuitively supplied assumption that x and y are generals. For, if x and y are generals, then some generals—namely x and y—have every property which x and y have. The intuitively supplied assumption here supplies the most obvious backing for the mechanically derived assumption. Curiously, our earliest explicitly labeled enthymeme—Aristotle's example of the argument, "Doreius has won a crowned contest, for he has won in the Olympic games"—is of this type. (It

is also not an incomplete categorical syllogism, unless one recasts the argument very awkwardly.) The universal generalization of the associated conditional is that anyone who has won in the Olympic games has won a crowned contest, a claim compatible with the crowned contest in question being different from the Olympic games. The intuitively supplied assumption, which Aristotle regards as unexpressed because everybody knows it, is that the Olympics is a crowned contest. This claim is stronger than the universal generalization, and again supplies the most obvious backing for it. In these cases, then, the universal generalization thesis conforms to our intuitions to the extent that the assumption it supplies is at least part of what our intuitions tell us the argument assumes. Without background knowledge, it can be argued, our intuitions could play us false in such cases.

An example of the second type of discrepancy, in which the intuitively supplied assumption is weaker than the associated conditional's universal generalization, arises with the argument, "All socialists support trade unions, so you are a socialist." (This example too comes from Mary Richardson.) We would intuitively supply as the implicit assumption the claim that you support trade unions. And we would then go on to criticize the resulting argument as invalid, since it is an example of affirming the consequent which is not valid on other grounds. The universal generalization thesis, however, tells us that the argument assumes that, for any property *F*, if everyone who has *F* supports trade unions, then you have *F*. In somewhat more standard English: You have every property whose possessors all support trade unions. Taking the property of supporting trade unions as one such property, we can derive by instantiation the intuitively supplied assumption that you support trade unions. Since we cannot make a converse derivation, the assumption postulated by the universal generalization thesis is stronger than the intuitively supplied assumption. Is the universal generalization thesis therefore too strong? I think not. The intuitively supplied assumption is a reasonable conjecture about the arguer's assumption, what the arguer thought licensed his inference of the conclusion from the premiss. But this reasonable conjecture is an assumption which is insufficient to make the conclusion follow, and which therefore cannot serve as the argument's assumption, the principle in virtue of which the conclusion follows from the premiss, to which the arguer implicitly commits himself in drawing the conclusion. Since our purpose is to evaluate the inference in an enthymematic argument, we should supply an assumption which is sufficient to make the conclusion follow, and investigate the truth of that assumption, The universal generalization thesis gives us such an assumption, whereas our pre-theoretical intuitions do not.

4.5 Qualifications of the Universal Generalization Thesis

In discussing the enthymematic argument that John is asleep, because he is asleep when the television set is off, I mentioned that, where an argument contains repeated molecular content expressions, the universal generalization thesis is indeterminate as to whether one should generalize over the molecular repeated

content expressions, over atomic repeated content expressions separately, or only over some of them, and if so which ones. Here the intuitively correct resolution of the indeterminacy seems to occur if one generalizes over content expressions which are as molecular as is plausible, In other words, if a molecular content expression is repeated, one generalizes over the entire expression rather than over one of its constituent content expressions, or over each constituent content expression separately—unless it would be implausible to do so.

The universal generalization thesis is indeterminate in a second respect. If the associated conditional contains more than one repeated content expression, where these are not part of a single molecular content expression, the thesis does not tell us which of these expressions we are to generalize over; an argument which reveals this indeterminacy is the argument, "Marijuana should be legalized, because it is no more dangerous than alcohol, which is already legal," where we are not sure whether to generalize over all or only some of the repeated content expressions "marijuana," "alcohol" and "legal." The intuitively correct resolution of this indeterminacy is to generalize over each of the repeated content expressions unless it would be implausible to do so. For example, the argument for legalizing marijuana assumes that any substance which is no more dangerous than an already legal substance should be legalized. If we generalize only with respect to "marijuana," we get the implicit assumption, "If alcohol is already legal, anything which is no more dangerous than alcohol should be legalized." If the argument depended only on this assumption, then it would be irrelevant to object that by the same reasoning one would have argued in the nineteenth century that heroin should be legalized, since it is no more dangerous than opium, which is already legal. But this objection seems relevant. So it seems justifiable to generalize the associated conditional with respect to both "marijuana" and "alcohol," producing the result that conforms to our intuitive judgment. Note that it is not so plausible to generalize with respect to the content expression "legal." If we did so, we would attribute to the argument the assumption that any substance which is no more dangerous than another substance should be given all the properties which the other substance has. Such an assumption is absurd, because, for example, it is impossible to give marijuana the chemical properties of alcohol.

Apart from these confirmations by our intuitive judgment, the justification for broad and multiple generalization is that arguments are implicitly general, so that any repeated content expression is a candidate for generalization. The justification for making exceptions on grounds of implausibility is the principle of charity: in case of ambiguity, interpret a passage in the way in which it makes the best possible case.

The last example exhibits a third and final indeterminacy in the universal generalization thesis. Over what class or category should we generalize the repeated content expression(s)? For some arguments, the class or category is a matter of indifference, since it drops out in the simplification of the generalized conditional. For other arguments, the class or category makes a difference. I generalized "alcohol" and "marijuana" over the class of substances. If one generalized over kinds of entities, or over any item whatever, one could easily find objections to the

implicit assumption thus generated. For example, driving a car without a seat belt is no more dangerous than hang-gliding, which is legal, but not everyone accepts the proposition that driving a car without a seat belt should be legalized. But such an objection seems unfair. The argument involves a comparison of the danger of two substances, in particular, of two mood-altering drugs, and it seems unreasonable to extend the principle on which the argument is relying beyond this subcategory.

In some cases the context will impose restrictions on the class over which to generalize. Ennis (1969) gives an example of a teacher asking a group of elementary school pupils to say whether words ending in "-ing" are participles or gerunds in given sentences. Asked to justify his claim that a given word is a gerund, a pupil replies, "Because it is the subject of a sentence." This is a good justification, but the generalization, "Every subject of a sentence is a gerund," is false. The context of utterance of the pupil's argument indicates that we should generalize the associated conditional only over the class of words ending in "-ing". Doing so, we get the sentence, "For any word ending in '-ing', if it is the subject of a sentence, it is a gerund," or, in more standard English, "Every word ending in '-ing' which is the subject of a sentence is a gerund."

In short, the appropriate qualification of the universal generalization thesis seems to be that each generalized content expression should be generalized over the entire category to which it belongs, unless the context or considerations of plausibility indicate a restriction on this category.

We are now in a position to articulate the fully qualified version of the universal generalization thesis:

> The author of an enthymematic argument implicitly assumes the truth of a universal generalization of the argument's associated conditional with respect to one or more content expressions which occur more than once. Unless it would be implausible, where a molecular content expression is repeated, this generalization is over the most molecular repeated content expression. If more than one distinct content expression is repeated, this generalization is over all such distinct content expressions except those over which it would be implausible to generalize. Unless the context of utterance of the argument or considerations of plausibility indicate a restriction, the generalization is over the entire category of items within which the content expression's significatum occurs.

4.6 Missing Premisses or Rules?

I now turn to the question hinted at earlier of whether we should regard the implicit assumption in virtue of which an enthymeme's conclusion follows from its explicit premiss(es) as a missing premiss of the enthymeme. Although this interpretation of the implicit assumption is the usual one, it is problematic.

First, we ordinarily define an argument as a set of statements, one of which, the conclusion, is advanced on the basis of the other(s), the premiss(es). To say that an argument has a given premiss is to say that that statement is a member of the set. But by definition a missing premiss is not a member of the set; it is not a statement, because it is not stated. So, in saying that an argument has a missing (or unexpressed,

or tacit, or unstated, or suppressed) premiss, we seem to be saying that an argument has a premiss which it does not have.

One can avoid the self-contradiction just expressed by redefining the concept of argument to include among the premisses sentences which the arguer had in mind but left unstated. A second problem, however, arises. To regard an enthymeme's implicit assumption as a missing premiss is to regard the argument as somehow defective or incomplete. But most deductive arguments, I would guess, are enthymematic, and even the most logically acute among us are prone to utter enthymematic arguments. We should therefore be suspicious about a theory which regards enthymematic arguments as incomplete.

A common response to this problem is to explain the frequency of such allegedly logically defective arguments by their superior rhetorical effectiveness. We have the authority of Aristotle, in the aforementioned passage from the *Rhetoric*, for the view that orators, in order to make their arguments brief enough for audiences to follow, will omit premisses which the hearer can supply because everybody knows them, The trouble with this explanation, and in my view the most serious objection to regarding an enthymeme's implicit assumption as a missing premiss, is that we are unaware of having omitted a premiss when we advance an enthymeme, especially when we do so to convince ourselves. We should, I conclude, be sceptical of the claim that enthymemes are logically incomplete, with a missing premiss.

The standard alternative to the missing premiss approach is to take the implicit assumption of an enthymematic argument as the articulation of a rule of inference in virtue of which the conclusion follows from the premiss(es). This rule approach can be found in Toulmin (1958), who seems to have gotten it from Ryle (1954). It is also adopted by George (1972, 1983), who gets it from the nineteenth century logician Bolzano (1972/1837). The rule in question will be a non-formal rule of inference, in the sense that the statement of the rule will include at least one content expression. If this rule is implicit, nothing is missing from the enthymeme which ought from a logical point of view to be stated, just as there is no omission if a formal rule of inference like *modus ponens* is not stated when a conclusion is drawn in accordance with it.

Regarding the implicit assumption as a rule makes it possible to evaluate an enthymematic inference without stating the implicit assumption. The procedure is a modification of the procedure of counter-exampling described above as a method of testing for formal deductive validity. Just as a substitution on the atomic content expressions of an argument which produces an argument with true premisses and a false conclusion will show that the formal rule of inference in accordance with which the original argument's conclusion follows from its premiss(es) is invalid, so a substitution on the repeated content expressions which produces an argument with true premisses and a false conclusion will show that the non-formal rule of inference in accordance with which the original argument's conclusion follows from its premiss(es) is invalid. In the first case we say that the argument is not formally deductively valid. Let us say in the second case that the argument is not **enthymematically valid**. This concept of enthymematic validity is due to George (1972, 1983), following Bolzano (1972/1837). To define this concept, we need the

concept of an enthymeme's **variable content expressions**, the repeated content expressions over which one generalizes in articulating its implicit assumption; the criteria for their identification appear in the qualified version of the universal generalization thesis. We also need the concept of a **permissible substitution**, the substitution for a variable content expression of a content expression which belongs to the class or category over which that variable content expression is generalized in articulating an enthymeme's implicit assumption; the criteria for delimiting this class or category also appear in the qualified version of the universal generalization thesis. With these concepts, we can define an argument as **enthymematically valid** if and only if no uniform permissible substitution on its variable content expressions produces an argument with true premisses and a false conclusion. To show that an enthymeme is (enthymematically) invalid, therefore, we simply need to construct an appropriately parallel argument with true premisses and a false conclusion. I have already given some examples of this procedure. Thus, the desirability of legalizing marijuana does not follow from the fact that marijuana is no more dangerous than alcohol, which is already legal: opium was legal in the nineteenth century and is no more dangerous than heroin, but it was not desirable at that time to legalize heroin. And to the argument for the safety of Depo-Provera, one can reply that you might as well say that the Dalkon Shield is safe because it is an effective contraceptive.

As with formal deductive validity, inability to construct such a counter-example does not prove enthymematic validity, since the inability might be due simply to a failure of imagination. To prove enthymematic validity, one needs to make the implicit assumption explicit and if necessary to support it with argument. The premisses of such supporting arguments are what Toulmin (1958) calls backing and Ennis (1982) backups, in this case for an implicit assumption rather than an explicit premiss. They are what Scriven (1976) refers to by the expression "optimal assumptions": the best basic support one can find for the drawing of the stated conclusion from the stated premisses.

4.7 Other Purposes for Identifying Enthymemes' Assumptions

So far I have been discussing the task of identifying an enthymeme's implicit assumption for the purpose of evaluating the enthymeme's inference. A survey of recent philosophical literature shows that philosophers at least sometimes have more specific and pointed reasons for identifying such implicit assumptions. It is instructive to consider the variety of such purposes and the way they modify the criteria for identifying the assumption.

Barnes (Aristotle 1975), for example, routinely fills in Aristotle's arguments, relying on the entire Aristotelian corpus, to try to *understand* why Aristotle thought his conclusions followed from his premisses. For this purpose, which is that of identifying the arguer's assumption rather than the argument's assumption, evidence of the arguer's beliefs will help to resolve ambiguities about the argument's implicit

assumption, and may furnish backing for the assumption one can reconstruct using just the argument itself. Reconstruction of the arguer's assumptions will be guided, on the basis of the principle of charity, by a presumption that they do genuinely license the inference involved—that is, that the argument will become deductively valid if the arguer's assumptions are added as extra premisses.

Philosophers such as Russell (1948), Palmer (1972), Bryant (1972), Geisler (1973, 1978) and Nowak (1978) supply an additional premiss to *strengthen* an apparently flawed argument by showing that the addition of a plausible premiss makes it a good argument. For this purpose, a premiss somewhat stronger than the assumption implicit in the argument itself may be appropriate.

Geisler (1978) and Fumerton (1980) supply an extra premiss in order to *seek support* for their own position by showing that the author of an argument implicitly supports that position. For this purpose, one needs to be as charitable as possible to the author of the argument, since one needs to claim that any defensible filling out of the argument commits its author to one's own position.

Ford (1975) supplies additional premisses to *discredit* an argument by showing that any added premisses sufficient to make it deductively valid are false. This purpose also requires as charitable as possible a filling out of the argument's premisses.

4.8 Note

I presented earlier versions of portions of this paper at the June 1983 Second International Symposium on Informal Logic in Windsor, Ontario; at the December 1983 session of the Association for Informal Logic and Critical Thinking held in conjunction with the Eastern Division meetings of the American Philosophical Association in Boston; at the Third International Conference on Critical Thinking and Educational Reform in July 1985 at Sonoma State University in Rohnert Park, California; at Conference '86 on Critical Thinking at Christopher Newport College, Newport News, Virginia, in April 1986; and at the 30th annual congress of the Canadian Philosophical Association in Winnipeg, Manitoba in May 1986. I am grateful for these opportunities to receive feedback on my ideas. In particular, I would like to acknowledge the helpful comments of Ennis, Maurice Finocchiaro, Govier, Carlos Pereda, Mary Richardson, Howard Simmons, and an anonymous referee for the Canadian Philosophical Association.

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Chapter 5
Does the Traditional Treatment of Enthymemes Rest on a Mistake?

Abstract In many actual arguments, the conclusion seems intuitively to follow from the premisses, even though we cannot show that it follows logically. The traditional approach to evaluating such arguments is to suppose that they have an unstated premiss whose explicit addition will produce an argument where the conclusion does follow logically. But there are good reasons for doubting that people so frequently leave the premisses of their arguments unstated. The inclination to suppose that they do stems from the belief that the only way in which an argument's conclusion can follow definitely from its premisses is to follow logically. I argue that this belief is mistaken. I propose a revision of the current generic conception of logical consequence, and its variant specifications, to avoid the paradoxes of strict implication. The revised conception can then be naturally extended to include also what we might call 'enthymematic consequence'. This concept is a kind of consequence, whose properties merit investigation.

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5.1 Enthymemes

5.1.1 Actual Arguments

Theorizing about arguments often suffers from a lack of attention to actual arguments. By an actual argument, I mean an uttered premiss-conclusion (or claim-reason) complex in which the conclusion is actually drawn from the premisses (reasons are given in support of the claim).[1] That is, the premiss-conclusion complex is used rather than mentioned, typically in an attempt to secure or intensify the audience's adherence to the conclusion. To theorize without attention to such actual arguments, manufacturing 'examples' which fit one's theory but which might be quite unlike actually used arguments, is to risk irrelevance or serious error. Let us begin, therefore, by considering an actual argument. A recent attack on the theory of evolution appealed to the absence in the fossil record of remains of any organisms transitional between humans and their supposed primate ancestors. In reply, an objector advanced the following argument:

> (1) A damp forest environment will lead to the decay of bones before fossilization is possible. Since most primates live in these forests, it will obviously be rare to find bones of any members of these species (Cowley 1993, p. 7).

This argument resembles many[2] actual arguments in this respect: its conclusion seems to follow[3] from its premisses, but we cannot translate it into any logical system, such as classical propositional logic or categorical syllogistic or classical first-order predicate logic, in which it does follow. In short: its conclusion follows, but not logically.

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[1]This conception does not necessarily assume that the premisses and conclusion are asserted by the author of the argument. There are suppositional arguments, in which a premiss is merely supposed to be true for the sake of the argument, and dialectical arguments, in which the author of the argument draws a conclusion from premisses which are concessions of an interlocutor.

[2]I think very many. Let us set aside actual arguments in which the appropriate standard of evaluation to apply is whether the premisses make the conclusion probable or offer defeasible grounds for accepting it. Of the remaining actual arguments, I suspect that well over half are enthymemes, in the sense that they have the feature I am going to describe. As a kind of test of this suspicion, I picked the above example in a haphazard (but not scientifically random) fashion from a collection of about 3000 argumentative texts discovered by my students. The first text I found was a report of someone else's argument. The second, rather surprisingly, turned out to contain a formally valid argument. The third provided the argument here quoted. It would of course take a statistically well-designed survey to demonstrate how common enthymemes are.

[3]I use the term 'follow' in this paper in the everyday sense of that relation between conclusion and premisses which is an essential feature of a good argument. To say that a conclusion follows from certain premisses is synonymous with saying that it is a consequence of them. These concepts of following and of consequence are everyday concepts in common use; technical concepts like that of formal validity are attempts to give them theoretical precision, and should be judged with reference to ordinary usage (which is however corrigible).

5.1.2 The Traditional Treatment

5.1.2.1 The Appeal to Unstated Premisses

The usual explanation of this discrepancy is that the argument has an unstated premiss.[4] If this unstated premiss is explicitly added to the argument, then the argument's conclusion turns out to follow logically from the new set of premisses. The argument's conclusion can thus be said to follow conditionally from its original premisses, that is, on condition that the unstated premiss meets one's theoretical condition for premiss adequacy (whether this be truth, acceptance by a dialectical interlocutor, acceptability, being known, or whatever). In such a case one can say that the argument's conclusion follows from the original unsupplemented set of premisses, in some extended sense of 'follows from'.

Thus we might say that (1) has an unstated premiss:

(2) It will be rare to find bones of any members of a species which lives in an environment which leads to the decay of bones before fossilization is possible.

If (2) is added as a premiss, then the argument's conclusion follows logically from the new set of premisses. So this argument's conclusion follows from its stated premisses on condition that this unstated premiss is adequate. And in fact it is an adequate premiss: it is true, and known, and would be accepted by any reasonable interlocutor that it will be rare to find bones of any members of a species which lives in an environment which leads to the decay of bones before fossilization is possible. So in an extended sense the conclusion of (1) follows from its stated premisses.

5.1.2.2 Extensions and Variants

In dealing with such arguments, the logical tradition stemming from Aristotle's categorical syllogistic confined its attention to one-premiss arguments which could be made into categorical syllogisms by adding a premiss. It called such arguments 'enthymemes', and the small number of types of categorical syllogisms made it possible to produce a usable and definite procedure for supplying the alleged unstated premisses of such arguments. But many arguments with the feature I have pointed out (that their conclusion apparently follows from their premisses, though not logically) are not incomplete syllogisms. It therefore seems reasonable to generalize the concept of an enthymeme beyond the limited Aristotelian application, and to regard all such arguments as enthymemes.

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[4]The terminology varies. The unstated premiss is variously described as missing, hidden, unexpressed, tacit, or suppressed. Of these terms, the words 'tacit' and 'unexpressed' are the least objectionable, as incorporating fewer theoretical assumptions about its status and the propriety of its non-explicitness.

This traditional treatment of enthymemes has variants. Ennis (1982), for example, distinguishes two types of what he calls 'gap-fillers': used assumptions and needed assumptions. Govier (1987, 1992) favours a policy of 'no supplementation without justification' (1992, p. 50), which leads her to focus on the first of these types, what the arguer implicitly accepts or can reasonably be assumed to accept; she does however allow that one may supply a 'missing premiss' which is implied by 'the direction of the reasoning', a notion for which she gives no theoretical analysis. Van Eemeren and Grootendorst (1984, 1992) regard the unexpressed premiss as implicit in the argument, thus focusing on the second of Ennis' two types. Anderson and Belnap (1961, p. 719) treat the task of evaluating the inference in an enthymeme neither as one of discovering some unstated claim which the arguer accepts nor as one of discovering some further premiss which is implicit in the argument, but rather as one of discovering an additional true sentence from which in combination with the stated premisses the conclusion follows logically.

These variations do not concern me. My concern is rather the common assumption that enthymemes have unstated premisses.

5.1.3 A Terminological Problem

The suggestion that most enthymemes do not have unstated premisses runs into an immediate terminological problem. The word 'enthymeme' is a quasi-technical term which has been stipulated to mean 'argument with an unstated premiss'.[5] If we accept this definition, we contradict ourselves when we say that there are enthymemes without unstated premisses. And how can we refuse to accept a definition which has been introduced by stipulation?

The answer to this problem is that not all introductions of technical terms are theoretically innocent. If the application of a technical term with a stipulated definition to a set of phenomena involves theoretical assumptions, then the definition of that term—taken as applying to that set of phenomena—can legitimately be challenged on the ground that one of those assumptions is incorrect. Humpty Dumpty was wrong: we cannot make words mean just what we say they mean.

The word 'enthymeme' as the label for a certain type of argument comes to us from Aristotle, who used the Greek word *enthymêma* for a rhetorical syllogism (*Rhetoric* I.1.1355a6—Aristotle 1984, p. 2153). Although Aristotle himself seems to have defined this type of syllogism in terms of its premisses' being likelihoods or

[5]Thus Quine (1972, p. 169) writes, 'An enthymeme is a logical inference in which one or more of the premises are omitted from mention on the ground that their truth is common knowledge and goes without saying.' His diagnosis of the reason for the omission of a premiss, which is not essential to the standard definition, echoes Aristotle: '… if any of these premises [sc. of the primary syllogism] is familiar, there is no need even to mention it; for the hearer adds it himself.' (*Rhetoric* I.2.1357a17–19) (Aristotle 1984, p. 2157; amended translation).

signs (*Prior Analytics* II.27.70a10; cf. *Rhetoric* I.1.1355a14–18—Aristotle 1984, pp. 112, 2153–2154), the Aristotelian logical tradition came to focus on another feature which Aristotle found in the orator's syllogism: its consisting of few premisses, often fewer than occur in 'the primary syllogism' (*Rhetoric* I.2.1357a16–17—Aristotle 1984, p. 2157), by which Aristotle meant the syllogism found in question-and-answer attempts at refutation which he called 'dialectic' (cf. *Rhetoric* II.22.1395b24–27–Aristotle 1984, p. 2224).[6] Aristotle's explanation for an enthymeme's having fewer premisses than a 'primary syllogism' was that the orator intentionally omitted something (*Rhetoric* II.2.1357a17–22—Aristotle 1984, p. 2157; see note 5 above). But this is a contestable theoretical explanation. What one can observe is that an enthymeme's conclusion does not follow logically from its premisses, but that adding a premiss transforms it into an argument whose conclusion does follow logically from its premisses.

5.1.4 Doubts

Prima facie, a spoken or written argument has just the premisses which are spoken or written. The notion that such an argument (the one which somebody spoke or wrote) has an additional premiss which is not expressed requires supporting evidence.

5.1.4.1 Intentional Omission?

If we follow Aristotle, Quine and others in supposing that the author of an enthymeme has intentionally omitted something, then we might expect the author to be conscious of having done so, or at least to be able to supply an extra premiss when asked to repair an omission. Since arguments are produced by persons who are by and large aware at least for a short time of what argument they have advanced, an appropriate test of the unstated premiss assumption would be to ask authors of arguments, immediately after they have produced their arguments, some such question as: 'Is there any additional premiss of your argument which you have left unexpressed? If so, what is it?'[7] Speaking for myself about the (enthymematic)

[6] In a careful and extensive exegetical study, Burnyeat (1994) traces how the ancient commentators on Aristotle came to attribute to him the conception found in so-called 'traditional logic' of an enthymeme as a syllogism with an unstated premiss, even though (according to Burnyeat) what Aristotle took to be characteristic of rhetorical 'syllogism' was its quasi-deductive character, its appeal to principles which hold only for the most part, or which only seem to hold for the most part, to license a definite conclusion.

[7] The results of such a test would not be decisive. A person who had consciously omitted a premiss in articulating an argument might not remember having done so. And a person who had not consciously omitted a premiss might be led by the test to construct such a premiss. But a

argument of the immediately preceding sentence, I have not left any premiss of my argument unexpressed, as far as I am aware. Readers can ask themselves the same question immediately after they advance an argument, and see whether they are aware of having omitted a premiss. As far as I can tell, we are not conscious of dropping a premiss from our enthymemes, even retrospectively. In fact, we reason enthymematically when we think things out for ourselves; in that context, it is implausible to suppose that we are omitting a premiss which the audience can supply for themselves, since we *are* the audience.

It might be, of course, that we intentionally omit premisses from our reasonings, but do so unconsciously. Much verbal reasoning, especially the spoken reasoning of everyday conversation, takes place in a context where speaker and audience share beliefs, and where such beliefs function as an implicit framework to which neither speaker nor audience pays attention. But such an unthematized implicit framework is more likely to be that in accordance with which people reason than to be that from which they reason, to be part of procedural knowledge rather than content knowledge.[8] At any rate, it would need to be shown that a background belief of the author of an argument is functioning as an unstated premiss of that argument, if the author is not conscious of having intentionally omitted it in the process of stating it.

5.1.4.2 Implicit Presence?

If we suppose that unstated 'gap-filling' premisses are implicit in enthymemes in some other way than through having been consciously omitted, then we must provide an explanation of how enthymemes imply such gap-fillers. A common move is to suppose that the use of an inferential particle like 'since' or 'therefore', or the juxtaposition of conclusion and premisses in such a way as to indicate that the former is being drawn from the latter, means that the conclusion follows from the premisses. If there is no qualifier like 'probably' or 'prima facie', then the argument implicitly claims that its conclusion follows from its premisses, without any hedging. And to follow is to follow logically. Since the conclusion does not in

(Footnote 7 continued)

widespread negative response to this test would tell strongly against the hypothesis of conscious omission of a premiss. I discuss the possibility of intentional but unconscious omission below.

[8]Thus, for example, there is no particular reason to expect a person who advances a disjunctive syllogism argument of the form 'either p or q, but not p, so q' to be conscious, even retrospectively, of having used a rule of disjunction elimination in drawing the conclusion. For this rule functions as that in accordance with which the person reasons, as procedural knowledge, rather than as that from which the person reasons, i.e. content knowledge. The oddity of the suggestion that authors of enthymemes intentionally omit a premiss is that people argue from their premisses, rather than in accordance with them, and thus could reasonably be expected to be conscious of what their premisses are.

fact follow logically from the stated premisses, the argument implicitly assumes something else which is needed for the conclusion to follow logically.[9]

The questionable assumption in this line of reasoning is that to follow without any hedging is to follow logically. But let us grant this assumption for the time being, and see where it leads. It seems to imply that an enthymeme's unstated premiss is the minimal sentence whose addition will produce an argument whose conclusion follows logically, minimal in the sense that it is a logical consequence of any other sentence whose addition will produce a logically conclusive argument. For the inference indicator of the unsupplemented argument is supposed only to imply that the conclusion follows logically; there is no basis for postulating an unstated premiss which is stronger than is needed to bring this about.[10] Hence our unstated premiss should be the weakest sentence q such that the conclusion c is a logical consequence of the stated premisses P combined with q. Consider then an arbitrary sentence q such that c is a logical consequence of P combined with q. On most conceptions of logical consequence, 'if P then c' will be a logical consequence of q.[11] And on most conceptions of logical consequence, c does follow logically from P and 'if P then c'.[12] Hence 'if P then c', construed truth-functionally, is the weakest sentence q such that c is a logical consequence of P and q together. Thus, on the variant which holds that the unstated premiss is implied by the textual indication that a conclusion follows, this unstated premiss should always have the form, 'not both P and not c', where P is the conjunction of the premisses and c is the conclusion. But in fact we do not in general supply such a weak claim when we state what is implicit in an enthymematic argument; we supply something stronger. The postulation of such stronger premisses cannot be justified solely by supposing

[9]Speech communication theorists, who have a more nuanced conception of an enthymeme than the logic textbooks, nevertheless tend to concede that enthymemes are incomplete from a normative perspective. '… most enthymemes are … formally deficient.' (Bitzer 1959, p. 404) 'Arguments made in conversation are generally incomplete when compared to critical models.' (Jackson and Jacobs 1980, p. 261). Conley (1984, p. 169) reports a scholarly consensus that an enthymeme is 'not just a truncated syllogism', that it is expressed as a truncated syllogism for practical rather than formal reasons, and that the missing premisses in an enthymeme expressed as a truncated argument are supplied by the audience. Conley himself shows that the conceptualization of enthymemes in the ancient rhetorical tradition is more complicated than even this nuanced consensus indicates.

[10]Van Eemeren and Grootendorst (1992) appeal to pragmatic considerations as a basis for taking one from the 'logical minimum' to the 'pragmatic optimum'. I am sceptical that this approach provides a coherent and plausible basis for explicitizing what is implicit in an enthymeme's inference. But it would take me too far afield to articulate my doubts.

[11]Where 'if P then c' is interpreted truth-functionally as logically equivalent to 'not both P and not c'. (According to a convention introduced by Quine, there should be corner quotes rather than normal quotation marks around expressions like 'if P then c' where part of the expression is being used to refer to itself and part in its customary or stipulated primary usage. Sticklers for this convention are asked to make the appropriate substitutions.).

[12]Construed truth-functionally. As Read (1988) points out, relevant logicians do not accept *modus ponens* under this interpretation. But classical and intuitionist logicians do.

that drawing a conclusion without hedging implies that the conclusion follows logically from the argument's premisses.

5.1.5 The Mistake

From Aristotle to today, logicians and argument analysts have postulated unstated gap-filling premisses for enthymemes because they could see no other way for a conclusion to follow definitely from given premisses than to follow logically. They postulated an unstated gap-filling premiss because they thought there was a gap. But they were mistaken. For most enthymemes, there is no gap.[13] A conclusion can follow definitely but not logically, with no postulation of unstated premisses. Following Kapitan (1972), I will refer to this alternative kind of consequence as enthymematic consequence.[14] I shall introduce this conception by starting from our current standard conception of logical consequence.

5.2 Logical Consequence

The standard conception of when a conclusion follows logically from given premisses is that it is impossible for the premisses to be true and the conclusion false. This standard conception immediately gives rise to the question: In what sense of 'impossible' is it impossible for a conclusion which follows from given premisses to be false while the premisses are true? We can distinguish five sorts of answers to this question in contemporary logical theory. I propose to characterize them briefly, as a prelude to considering how they might be extended to accommodate enthymemes.

5.2.1 The Deducibility Conception

On the deducibility conception, a sentence is a logical consequence of a set of premisses if and only if it can be deduced from those premisses in a formal system. This conception hardly seems basic, since one must show that the formal system is

[13]I write 'most' rather than 'all', because there are some enthymemes where intuitively speaking the conclusion follows but where the conclusion is not a consequence of the stated premiss(es) in the expanded sense of 'consequence' I develop in this paper. See Sect. 5.4.2 below.

[14]Kapitan (1980) raises some counterexamples to George's conception, and explores in (Kapitan 1982) some alternatives. George (1983) elaborates on his earlier conception. See also Hitchcock (1985, 1987). Toulmin (1958) implicitly endorses a similar idea in his conception of a warrant; see also Toulmin et al. (1984).

a good one, in the sense that any consequence deducible in it from given premisses is in fact a logical consequence of those premisses, in some other sense of logical consequence. Besides, as Tarski (2002/1936, pp. 177–178) points out, there are logical consequences which cannot be deduced within any formal theory. But recently Etchemendy (1990) has revived the deducibility conception within the framework of a natural deduction approach to the construction of formal theories stemming from Gentzen. According to Gentzen (1969/1935, p. 80), the meaning of a logical symbol can be given by an inference rule entitling us to introduce the symbol. The corresponding elimination rule is a mere consequence of such a definition. Thus, whether a sentence is a consequence of other sentences with respect to a given set of logical symbols could be taken to be equivalent to whether it could be deduced from those sentences using the introduction rules which define those symbols and the corresponding elimination rules. Consider for example the (non-actual) argument:

(3) Jesus is human. Since all humans are mortal, Jesus is mortal.

On the deducibility conception, one must translate this argument into the notation of a formal system appropriate for evaluating the deducibility of the conclusion from the premisses. The appropriate system for (3) is first-order predicate logic. I shall translate it into such a system with a perspicuous notation adapted from computer science:

(4) Human (Jesus).

FOR ALL x: IF human (x), THEN mortal (x).

So mortal (Jesus).

The argument thus translated contains two logical symbols of first-order predicate logic, the universal quantifier 'FOR ALL' and the conditional sentence connective 'IF … THEN'. The introduction rules of classical first-order predicate logic constructed on Gentzen's plan generate as corresponding elimination rules for these two symbols:

From 'FOR ALL x: F(x)', you may infer 'F(a)'. (UQE: universal quantifier elimination)[15]

From 'IF p THEN q' and p, you may infer q. (IFE: conditional elimination)[16]

A Gentzen-style deduction of the conclusion of (4) would run as follows:

1. FOR ALL x: IF human (x), THEN mortal (x). So IF human (Jesus), THEN mortal (Jesus). (UQE)

[15]Where a is the name of an individual in the domain of discourse, x is a variable ranging over the individuals in the domain of discourse, F(x) is a formula of the system containing at least one unbound occurrence of x, and F(a) results from this formula by replacing all unbound occurrences of x in F(x) by a.

[16]Where p and q are sentences.

2. IF human (Jesus), THEN mortal (Jesus). Human (Jesus). So mortal (Jesus). (IFE)

3. Human (Jesus). FOR ALL x: IF human (x), THEN mortal (x). So mortal (Jesus). (1, 2, cut)

Gentzen's approach requires supplementing the introduction and elimination rule for each logical symbol with so-called 'structural rules', like the cut rule used at step 3, which enable us to chain different logical consequences together. Such compound structures are characteristic of argumentation in natural languages, and so it is important to check which structural rules a given conception of consequence will legitimize.

5.2.2 The Modal Conception

On the modal conception, an argument's conclusion follows logically from its premisses if and only if '*there is no possible situation where the premisses are true and the conclusion false'* (Read 1994, p. 250; italics added).

To apply this conception, one thinks of possible situations in which the premisses are true and the conclusion false. If there is such a possible situation, then the conclusion does not follow; thus, for example, the conclusion of the argument

(5) Salt is a crystal, so salt is soluble in water.

does not follow from its premiss, because it is a possible situation that salt is a crystal but does not dissolve in water; that is, the world might have been created this way, and there is no contradiction in thinking so. If there is no possible situation in which the premisses are true and the conclusion false, then the conclusion does follow; thus, the conclusion of

(3) Jesus is human. Since all humans are mortal, Jesus is mortal.

follows from its premisses, since there is no possible situation where Jesus is human and all humans are mortal but Jesus is not mortal.

The modal conception can account for cases where a conclusion follows logically from given premisses, even though it is not deducible from them in a formal system. Thus the conclusion of the argument

(6) Iain is a bachelor, so Iain is unmarried.

follows from its premiss, because the meanings of the terms 'bachelor' and 'unmarried' rule out any situation in which the premiss is true and the conclusion false. Read (1994, p. 257) explicitly argues against the claim that the conclusion only really follows when a 'suppressed premiss' that all bachelors are unmarried is made explicit. The modal conception can thus be used to account for the link between premisses and conclusion in some enthymemes without postulating an unstated

premiss. But the modal conception cannot account for all such links, only for those where the implicit claim which we mistakenly identify as an unstated premiss is a necessary truth.

The modal conception requires clarification of what sense of 'possible' is involved. Its proponents seem to intend a sense which is relative to the meaning of an argument's component sentences. So their conception might be reworded more precisely as the notion that an argument's conclusion follows from its premisses if their meaning is incompatible with there being a situation where the premisses are true and the conclusion false.

5.2.3 The Substitutional Conception

The substitutional conception stems ultimately from Bolzano (1972/1837). Like the deducibility conception, it presupposes a distinction between logical and extra-logical symbols. But, whereas the deducibility conception focuses on the logical symbols, the substitutional conception focuses on extra-logical constants, words or expressions which refer to or otherwise signify individual objects, properties and relations. A conclusion is a logical consequence of given premisses on a substitutional conception if and only if there is no substitution on its extra-logical constants which produces an argument with true premisses and a false conclusion. Thus the conclusion of

(3) Jesus is human. Since all humans are mortal, Jesus is mortal.

is a logical consequence of its premisses, because no substitution on the extra-logical constants 'Jesus', 'human' and 'mortal' will produce an argument with true premisses and a false conclusion.

5.2.4 The Formal Conception

The formal conception, of which we find a variant formulation in Smiley (1959), takes logical consequence to be primarily a property of forms of argument. By a form of argument is meant a linguistic schema which includes at least one variable but no extra-logical constants and from which an argument can be derived by replacing all occurrences of each variable with the same extra-logical constant or grammatically parallel complex content expression. A form of argument is logically valid if it has no instances so derived with true premisses and a false conclusion. Derivatively, we can say that a conclusion follows logically in the formal sense if and only if the argument is an instance of a form of argument which has no instances with true premisses and a false conclusion.

Thus for example the conclusion of the argument

(3) Jesus is human. Since all humans are mortal, Jesus is mortal.

follows logically from its premisses on the formal conception, since it is an instance of the form of argument

(7) Fy. FOR ALL x: IF Fx THEN Gx. So Gy.

which has no instances with true premisses and a false conclusion.

5.2.5 *The Model-Theoretic Conception*

The model-theoretic conception of logical consequence, which according to Etchemendy (1990) has been the universally received conception in contemporary logical theory, received its classical formulation from Tarski (2002/1936). Tarski proposed it as a remedy for a problem he saw with the substitutional conception of logical consequence (a problem which also affects the formal conception). Although the substitutional conception provides a necessary condition for logical consequence, it is a sufficient condition only if the language contains a means of referring to every object, and to every set of n-tuples of objects. Most of the formalized languages for which Tarski offered his conception do not meet this condition. Tarski's solution to this problem was to keep the language of the argument fixed, but to allow the interpretation of its extra-logical components to vary. Using the concept of satisfaction of a sentential function by a sequence of objects which he developed in his classic essay on truth (Tarski 1983/1933), Tarski defined a model of a sentence as a sequence of objects which satisfies the sentential function obtained from that sentence by replacing all extra-logical constants by corresponding variables (For example, the sequence 'the moon, being a satellite of the earth' is a model of the sentence, 'Jesus is mortal', because it satisfies the sentential function 'x is F'.). This concept of model enabled Tarski to give the following concise definition of logical consequence: "… *the sentence X f o l l o w s l o g i c a l l y from the sentences of the class* K *if and only if every model of the class* K *is at the same time a model of the sentence X*." (Tarski 2002/1936, p. 186; italics and extra spacing in original)

Etchemendy (1990) has recently challenged Tarski's definition, partly on the ground that it falsely reduces the necessity of logical consequence to generality; not all generalizations whose only constants are logical constants are logical truths, and even where they are it is not the absence of extra-logical constants which makes them logical truths. In response, Sánchez-Miguel (1993), on the basis of a principled distinction between logical and extra-logical constants, left by Tarski as an outstanding problem, defends the claim that a generalization containing only logical constants is either logically true or logically false.

5.3 Revisions

5.3.1 Two Problems

These five conceptions of logical consequence are by no means equivalent to one another. Further, each of them has various specifications, depending for example on one's theory of the meaning of this or that logical symbol. Rather than discussing their differences, however, I wish to point out a weakness which they all share.

All five conceptions give rise to two paradoxes, which are in fact generic problems with the conception of the consequence relation as one in which it is impossible for the premisses to be true and the conclusion false. If the word 'and' in this standard conception is construed as expressing truth-functional conjunction,[17] then this conception implies that any conclusion at all follows from premisses which cannot all be true: if it is impossible for the premisses to be true, then it is *a fortiori* impossible for the premisses to be true and the conclusion false. Thus the conclusion of

> (8) There are living organisms beyond the planet earth. There are no living organisms beyond the planet earth. So Amsterdam is not the only capital of the Netherlands.

would on the standard generic conception of logical consequence follow from its premisses. Similarly, the standard generic conception implies that any conclusion which cannot be false follows from any premisses whatever: if it is impossible for the conclusion to be false, then it is *a fortiori* impossible for the premisses to be true and the conclusion false. Thus the conclusion of

> (9) The Hague and Amsterdam are capitals of the Netherlands. So whenever it is raining, it is raining.

would on the standard generic conception of logical consequence follow from its premisses. But intuitively speaking, the conclusions of arguments (8) and (9) do not follow from their premisses. In each argument, the premisses have nothing to do with the conclusion. So either the standard conception should be revised, or some argument is needed to show that our intuitive judgments about such arguments are mistaken. The appropriate revision of the standard conception, I suggest, is to add two conditions which together rule out the paradoxes. To rule out the first paradox, we add the condition that it is possible that the premisses are true. To rule out the second paradox, we add the condition that it is possible that the conclusion is false. Then we can be sure that the condition that it is impossible for the premisses to be true and the conclusion false is not trivially satisfied, but results from some connection between the premisses and the conclusion: namely, the conclusion follows

[17]This condition is necessary, because some relevantists have proposed an intensional (non-truth-functional) interpretation of 'and' in this context which does not have the two paradoxical consequences described above. See Read (1988, pp. 38–40; 1994, p. 265). I leave as an open question how to extend the concept of consequence in relevant and paraconsistent logics to enthymematic consequence.

from the premisses. Unfortunately, the specification of these two conditions for the modal and perhaps for the deducibility conception implies that logical falsehoods have no logical consequences, and that logical truths are not consequences of anything. These are new paradoxes, which we should also be loath to accept. For in each of the arguments

> (10) There are living organisms beyond the planet earth. There are no living organisms beyond the planet earth. So either there are living organisms beyond the planet earth or there are no living organisms beyond the planet earth.

and

> (11) If at an arbitrary time t it is raining, then it is raining at t. So whenever it is raining, it is raining.

the conclusion clearly is a logical consequence of the premisses. The substitutional, formal and model-theoretic conceptions can however be adapted so as to accommodate the two conditions without giving rise to these new paradoxes. In the substitutional and model-theoretic conceptions we need to allow for the replacement not only of atomic extra-logical constants but also of what we might call molecular content expressions, i.e. expressions of which atomic extra-logical constants are proper parts but which can be replaced by atomic extra-logical constants without loss of grammaticality. In this sense a sentence is a molecular content expression, as are such phrases as 'the planet earth' and 'damp forests'. If we allow replacement of such molecular expressions as whole units then we can reformulate all three conceptions so as to incorporate our two new conditions.

Thus, the substitutional conception becomes: there is a set of content expressions on which no substitution produces an argument with true premisses and a false conclusion, even though some substitution produces true premisses and some substitution produces a false conclusion. In this sense, the conclusion of (8) is not a logical consequence of its premisses, but the conclusion of (10) is, with respect to the content expressions 'There are living organisms beyond the earth' and 'There are no living organisms beyond the earth'.

The formal conception becomes: the argument is an instance of a form of argument which has no instances with true premisses and a false conclusion, even though this form has some instance with true premisses and some instance with a false conclusion. This is essentially the definition of Smiley (1959, p. 240). Again, we note that the conclusion of (8) is not a logical consequence in this sense of its premisses, but that the conclusion of (10) is, because (10) is an instance of the form, 'p, q, so either p or q.'

The model-theoretic conception becomes: every model of the premisses is also a model of the conclusion, at least one sequence is a model of the premisses, and at least one sequence is not a model of the conclusion. The definition of a model has to be revised so as to allow the conclusion of (10) to be a logical consequence of its premisses in this sense.

5.3.2 A Revised Generic Conception of Consequence

If we abstract what is common to the three revised conceptions just described, we get the following revised generic conception of consequence: There is some general feature of the argument which is incompatible with the argument's having true premisses and a false conclusion, even though that feature is compatible with the argument's having true premisses and compatible with the argument's having a false conclusion. As stated, this generic conception does not require that the operative general feature must contain no extra-logical constants. If it does contain an extra-logical constant, then we may call the consequence relation enthymematic consequence (as opposed to logical consequence). The revised generic conception of consequence, in one respect narrower and in another respect much wider than the current standard generic conception of consequence, in my view explains better than any theory of unstated premisses our inclination to regard the conclusion of many enthymemes as a consequence of their premisses, even though it is not a logical consequence. Our inclination is correct; the conclusion of many enthymemes is an enthymematic consequence of their unsupplemented premisses. The revised generic conception of consequence also explains our inclination to attribute to such arguments an implicit claim which is stronger than what is needed as an added premiss to make the conclusion follow logically. In inferring a conclusion from some premisses, the author of an argument implicitly claims that the conclusion follows from those premisses. On the generic conception of consequence which I am proposing, this claim amounts to the claim that some covering generalization of the argument is true.[18] Any such covering generalization is stronger than the minimal added premiss required to make the conclusion follow logically. The addition of such a covering generalization as a premiss would therefore make the conclusion follow logically. But in fact it is not an unstated premiss; it is what Toulmin (1958, 1984) calls a warrant, something which is in its form a statement but in its function a rule of inference.

5.4 Enthymematic Consequence

5.4.1 Example

Like logical consequence, enthymematic consequence can be given a substitutional, formal or model-theoretic specification. Let us apply a formal specification to our original actual argument:

[18]For the expression 'covering generalization', see (Hitchcock 1985, 1987).

(1) A damp forest environment will lead to the decay of bones before fossilization is possible. Since most primates live in these forests, it will obviously be rare to find bones of any members of these species.

First we need to make explicit the anaphoric references, as well as the intended meaning of 'most primates',[19] as follows:

(12) A damp forest environment will lead to the decay of bones before fossilization is possible. Most species of primates live in a damp forest environment. So it will obviously be rare to find bones of any members of most species of primates.

(12) is an instance of the form:

(13) An F environment will lead to the decay of bones before fossilization is possible. Most species of Ps live in an F environment. So it will obviously be rare to find bones of any members of most species of Ps.

This form of argument is not logically valid. But it is valid in the sense that it has no instances with true premisses and a false conclusion, even though it has instances with true premisses and instances with a false conclusion. Thus the conclusion of any argument of this form (including argument (12) in particular) follows (enthymematically) from its premisses. The condition that (13) is a valid form of argument is equivalent to the covering generalization:

(14) For all F and P: If an F environment will lead to the decay of bones before fossilization is possible, and most species of Ps live in an F environment, then it will obviously be rare to find bones of any members of most species of Ps.

Or, in somewhat more plain English:

(2) It will obviously be rare to find bones of any members of a species which lives in an environment which will lead to the decay of bones before fossilization is possible.

Since (2) is true, then (13) is a valid form of argument. Hence the conclusion of (1) follows from its premisses, as we intuitively suppose. But (2) is not an unstated premiss of (1); rather, it is a warrant for it. In Toulmin's terms (1958, p. 98) it does not answer the question 'What have you got to go on?' but rather the question 'How do you get there?', i.e. how do you get from your premiss(es) to your conclusion.

5.4.2 *Exceptions*

For a conclusion to follow enthymematically from stated premiss(es), there must be some non-logical element shared by the conclusion and a premiss. (In argument (1),

[19]The phrase 'these species' refers back to a previously identified set of species, and the only phrase which can be construed as identifying it is 'most primates'. So the author evidently takes 'most primates' to mean 'most species of primates' rather than 'most individual primates'. On the latter construal, the conclusion does not follow, so by the principle of charity we should resolve the ambiguity in favour of the former construal.

the expressions ‘bones’ and ‘most primates’ are such shared non-logical elements.) But some actual arguments whose conclusion seems intuitively to follow from their premiss(es) have either no such shared element or no acceptable covering generalization on a shared element. Here is an example:[20]

(15) Detroit edged Baltimore in the ninth inning. Therefore Toronto is now alone in first place.

One can get a shared non-logical element by making explicit the temporal reference of the premiss and the conclusion:

(16) Today Detroit edged Baltimore in the ninth inning. Therefore, today Toronto is alone in first place.

But the covering generalization with respect to this shared element:

(17) Toronto is alone in first place on any day on which Detroit edged Baltimore in the ninth inning.

is clearly false. To understand how the conclusion follows, we have to recognize first that the conclusion conversationally implicates that before the Detroit-Baltimore game Toronto was not alone in first place, but was sharing it with another team. How could the result of a Detroit-Baltimore game move Toronto from a tie for first place to being alone in first place? Only by the losing team being the team which was sharing first place with Toronto. Thus, the conclusion of (15) follows only if at the beginning of the day Baltimore shared first place with Toronto.[21] This would clearly be background information well known to the hearers of a sports broadcast. It can be regarded as an implicit qualification of ‘today’, thus permitting the following restricted version of (17) to function as a covering generalization of (15):

(18) If two baseball teams are tied for first place at the beginning of a day on which a third team edges out one of them in the ninth inning, then the other team is alone in first place at the end of that day.

But even this is false, for the other team would not be alone in first place if it also lost a game that day or if another team caught up to it that day. So additional restrictions have to be imposed on the generalization. And the applicability of this additionally restricted generalization to (15) would have to be justified in terms of background information assumed to be known to the broadcast audience. Thus, if

[20]From a radio sports broadcast. Rolf George supplied this example in his commentary on an earlier version of this paper at a conference of the Ontario Philosophical Society.

[21]The listener is expected to understand that ‘Detroit’, ‘Baltimore’ and ‘Toronto’ refer to professional baseball teams based in the named cities, teams which in fact belong to the same division of the same league. In North American professional baseball, standings in each division are determined each day by the number of games each team has won and lost up to that day in the given season. The leader in each division is the team with the largest positive balance of won games over lost games. If two teams in a division have won the same number of games but one has lost fewer games, the team with fewer losses is ahead of the team with more losses.

(15) was indeed a valid argument (one whose conclusion followed definitely from its conclusion), it was valid not only in virtue of a general principle like (18) but also in virtue of specific information about the earlier position of the teams in the standings and the result of Toronto's game that day. For such arguments, the unstated premiss analysis is partly correct. I speculate that these arguments are generally spoken rather than written arguments, where the speaker communicates to an audience against a background of specific information which is assumed to be shared.[22] I suspect that arguments which are so elliptical that one cannot generate a covering generalization from their explicit components are comparatively rare.

5.4.3 An Objection

At this point, some readers may wonder what the difference is, practically or theoretically, between the traditional approach to arguments like (1) which holds that they have an unstated premiss, and the enthymematic consequence approach which holds that they are valid as they stand in virtue of a warrant like (2). After all, both approaches find the same proposition, (2), implicit in the argument. And both approaches reach the verdict that the conclusion of (1) follows from its stated premisses because (2) is true (or meets some other adequacy condition). Such a reaction is particularly likely because of my use of Toulmin's term 'warrant' for the principle which articulates an enthymematic rule of inference. Many people who use Toulmin's terminology of 'claim', 'data' and 'warrant' treat data and warrant as two sorts of premisses. So they will think that, in calling (2) a warrant of (1), I am treating it as an unstated premiss.

To view Toulmin's warrant as a premiss is however to undermine the point of his revisionary conception of the constituents of argument. The word 'premiss' means etymologically 'that which is sent beforehand' (Latin 'praemissum') and was coined as the equivalent of Aristotle's *protasis*, that part of a syllogism which is laid down and from which something else (the conclusion) follows. The premisses of an argument are its basis, that from which the conclusion is drawn. They are the answer to the question: 'On what do you base your claim?' So in Toulmin's

[22]Rolf George pointed out in his commentary on an earlier version of this paper that Euclid's plane geometry lacks an axiom whose absence was not discovered until Hilbert's geometry: if one draws a straight line intersecting one side of a triangle, it will also intersect one of the other two, or run through the opposite vertex. This axiom is false for some triangles in doughnut-shaped planes, and is necessary to ensure that the plane is Euclidean rather than doughnut-shaped. Thus many of Euclid's theorems depend on such an axiom. But George thinks Euclid's proofs are too complex to permit the formal generation of this implicit assumption as a covering generalization. If he is right, this would be an additional exception to my claim that arguments whose conclusions intuitively follow definitely from their premisses do so in virtue of a covering generalization. Or perhaps we should say that without the axiom some of Euclid's conclusions do not follow from his premisses, even enthymematically.

vocabulary it is the data alone which should be regarded as the premiss or premisses of an argument.

Warrants, on the other hand, are answers to a quite different sort of question: 'How do you get from your data to your claim?' Toulmin tells us (1958, pp. 98–100) that data are information, whereas warrants are rules, principles or inference-licenses; data are starting-points for arguments, whereas warrants are general hypothetical statements which can act as bridges; and data are appealed to explicitly, warrants implicitly. Implicit general inference-licenses which can act as bridges from data to a claim are not premisses, but implicit rules of inference.

Toulmin himself seems to have thought that all warrants are substantive, or in my terminology enthymematic.[23] But there may be actual arguments whose premisses all function as grounds for the conclusion, and whose implicit warrant is a purely logical principle. Here is an example which comes close, found after several hours searching of argumentative texts:

> (19) … logic is not much help in dealing with our own and other people's wants, motivations, and feelings. Logic and reasoning generally deal with yeses or noes, black or white and all or nothing as an input to the logical process. But in fact, our wants, motivations, and emotions are usually not apparent to us in terms of all or nothing (Smith 1975, p. 58).

Simplifying the wording, and removing the qualifiers,[24] we get the argument:

> (20) Logic deals only with things that are apparent to us in terms of all or nothing. Our wants, motivations, and emotions are not apparent to us in terms of all or nothing. So logic does not deal with our wants, motivations, and emotions.

The warrant of this argument, I would maintain, is the formal (logical, analytic) principle:

> (21) If everything to which x stands in relation R has property F, and no Ks have property F, then x does not stand in relation R to any K.

Nobody would regard principle (21) as an unstated premiss of (20), even though it is implicit in (20).[25] Its function is not that of a premiss, but that of a principle in virtue of which the conclusion follows from its premisses. Just so, I would hold, a substantive warrant is not a premiss, but a principle in virtue of which the conclusion follows from the premisses. And, just as nobody would think that the author of (20) had failed to mention principle (21) because his audience could supply it, so

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[23]He does recognize a class of what he calls 'analytic arguments' (1958, pp. 123–141). But he defines these as arguments in which checking the truth of the data and of the backing for the warrant involves checking the truth of the claim/conclusion. The warrant of such arguments is just as substantive as that of so-called 'substantive arguments'.

[24]Removing the qualifiers distorts the argument. With the qualifiers, the conclusion does not follow logically. But nor does it follow in any other way, least of all in virtue of a substantive warrant. For the conclusion to follow, the author needs to remove at least one of the qualifiers on the premisses.

[25]For a classic and humorous demonstration of why it is unreasonable to insist on adding such purely formal inference-licensing principles as premisses, see Carroll (1895).

nobody should think that the author of (1) failed to mention (2) because his audience could supply it. In each case, the author failed to mention the principle in question because it was that in accordance with which he was reasoning, not that from which he was reasoning

What difference does it make to regard a principle such as (2) (whether or not it is identified with Toulmin's warrant) as an inference-license rather than a premiss? One difference is that we have no reason to expect authors of arguments to be aware of such principles, for people are generally not conscious of the principles in accordance with which they reason. Another is that we do not have to find reasons for going beyond the 'logical minimum' in searching for an implicit principle of an argument; all arguments are implicitly general, their conclusion following from their premiss(es) in virtue of some general principle. Another is that we should not conceive the search for such a principle as part of argument analysis, of trying to determine precisely the structure and content of the argument; rather, it is part of argument evaluation, of trying to determine whether the conclusion of an already completely analyzed argument follows from its stated premiss(es). Another is that we have much more definite guidance in our search for what is implicit in an enthymeme; it is a covering generalization of the argument. Another is that we need not expect a unique answer to our search for a principle warranting an argument's inference; a given argument may have no such principle (in which case its conclusion does not follow) or on the contrary have more than one (in which case the conclusion follows in more than one way from the premiss(es)).

5.4.4 Further Questions

Real differences, practical as well as theoretical, thus result from applying to arguments like (1) the proposed generic conception of consequence as a relation in which some general feature of an argument is compatible with the argument's having true premisses and compatible with the argument's having a false conclusion, but incompatible with its having both together. And many questions can be raised about this generic conception of consequence. What specific conceptions result if we give it a substitutional, formal or model-theoretic specification? What are the differences in extension, if any, between these different specifications? How closely do the different specifications fit our intuitive judgments of when a conclusion is a consequence of stated premisses? How closely does the covering generalization generated by this conception of consequence correspond to the implicit supposedly gap-filling assumption which we intuitively supply for the enthymemes we encounter? Where the theory differs from our intuitions, which gives a better judgment? Where our intuitions give a better judgment, can we revise our conception to accommodate them in ways that are not totally ad hoc? What structural rules of consequence apply to this generic conception of consequence and

to its various specifications?[26] What objections can be raised to the revised generic conception of consequence, and what replies to those objections are possible? What formal systems incorporate a given specification of the revised generic conception of consequence?

5.5 Summary

In many actual arguments, the conclusion follows from the premisses, even though it does not follow logically. The usual explanation of this fact is that such arguments have an unstated premiss whose addition would make the conclusion follow logically. I have argued that it is generally implausible to postulate this sort of unstated premiss, and that the inclination to do so stems from the mistake of identifying definite consequence with logical consequence. Once the current standard conception of logical consequence is revised to eliminate its paradoxical features, the revised generic conception accommodates not only logical consequence, but also what we might call enthymematic consequence. A conclusion is a consequence of given premisses in the revised generic sense if the argument has a general feature which is incompatible with the argument's having true premisses and a false conclusion, even though it is both compatible with its having true premisses and compatible with its having a false conclusion. It is a logical consequence if the general feature includes no reference to any extra-logical constants in the argument. It is an enthymematic consequence if the general feature includes a reference to at least one extra-logical constant in the argument. Many questions about the revised generic conception of consequence and about enthymematic consequence in particular remain open for investigation.

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[26]There is a convenient list of these structural rules in Read (1988, pp. 42–43). Some writers take satisfaction of these rules, especially the cut rule, as a necessary condition for an acceptable conception of consequence. But if a conception of consequence is acceptable on other grounds, but satisfies only a restricted cut rule, that restriction must simply be accepted as part of that conception of consequence. Some types of consequence just are not generally transitive, or generally monotonic.

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Chapter 6
Toulmin's Warrants

Abstract In *The Uses of Argument* (1958), Stephen Toulmin proposed a new, dialectically grounded structure for the layout of arguments, replacing the old terminology of "premiss" and "conclusion" with a new set of terms: claim, data (later "grounds"), warrant, modal qualifier, rebuttal, backing. Toulmin's scheme has been widely adopted in the discipline of speech communication, especially in the United States. In this paper I focus on one component of the scheme, the concept of a warrant. I argue that those who have adopted Toulmin's scheme have often distorted the concept of warrant in a way which destroys what is distinctive and worthwhile about it. And I respond to criticisms of the concept by van Eemeren et al. (*The study of argumentation*. Irvington, New York, 1984), Johnson (*The rise of informal logic*, pp. 116–152, Newport News, Vale Press 1996) and Freeman (*Dialectics and the macrostructure of arguments: A theory of argument structure*. Foris, Berlin, 1991). Their criticisms show the need for some revision of Toulmin's position, but his basic concept of warrant, I shall argue, should be retained as a central concept for the evaluation of arguments.

6.1 Toulmin's Conception

Despite the pluralism implicit in his title, Toulmin articulated his proposal for the layout of arguments in the context of a single use of argument, that of justifying one's assertion in response to a challenge (Toulmin 1958, p. 12). The proposed layout emerges from consideration of the questions that could arise in such a

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challenge. Prior to the challenge, there must be an assertion, in which there is involved a *claim*, by which Toulmin appears to mean the proposition asserted. A challenger's first question in response to such an assertion is something like, "What do you have to go on?", to which the answer will be *data* (Toulmin 1958, p. 97) or *grounds* (Toulmin, Rieke and Janik 1984, p. 38). But a challenger who accepts as correct the information given in answer to such a question can still ask a further question: "How do you get there?", to which the answer will be the *warrant* (Toulmin 1958, p. 98; Toulmin, Rieke and Janik 1984, p. 46). Whereas the data or grounds are the basis of the person's claim, the warrant is the person's justification for inferring the claim from those grounds. Justifying a step from grounds to claim, according to Toulmin, requires appeal to general considerations: "What are needed are *general*, hypothetical statements, which can act as bridges, and authorise the *sort* of step to which our argument commits us." (Toulmin 1958, p. 98; italics added) Warrants may be qualified by such *modal qualifiers* as "probably" or "generally" or "necessarily" or "presumably", a fact generally reflected by qualifying the claim; if the warrant is defeasible, then conditions of exception or *rebuttal* may be mentioned. Finally, a challenger may ask for justification of the warrant, to which the answer will be a proposed *backing* for the warrant.

To repeat Toulmin's hackneyed and familiar example, suppose someone asserts, "Harry is a British subject." A challenger requests justification of this claim, to which the reply is, "Harry was born in Bermuda." The challenger further asks how this ground supports the claim, to which the reply is, "A man born in Bermuda is generally a British subject." As a defeasible warrant, this assertion has conditions of rebuttal, which could be made explicit: "unless neither of his parents is of British nationality or he has changed his nationality". Asked to justify the warrant, the author of the claim will cite the British Nationality Acts, where these rules for determining nationality are set out (Toulmin 1958, pp. 99–102).

Toulmin equivocates on whether a warrant is a statement or a rule, often within the space of one or two pages.[1] The equivocation is harmless, since a warrant-statement is the verbal expression of a warrant-rule. But a rule is more basic than its verbal expression as a statement. A warrant, then, is a general rule which licenses or permits a step from grounds of a certain sort to a corresponding claim. It is implicit in the arguments people put forward to justify their claims (Toulmin 1958, p. 100), or at least not always explicit (Toulmin et al. 1984, p. 56). Although the same universal sentence may be used in one context to state one's grounds for a claim and in another one's warrant for inferring a claim from grounds, the two statements will differ in their logical function. For example, the sentence "All the children in this class have been vaccinated" when used to support a claim provides supposedly established information, but when used to justify an inference licenses a transition

[1]"Propositions of this kind I shall call *warrants* (W) … our warrant will now be some such statement as … the relevant laws give us a warrant to draw this conclusion." (Toulmin 1958, pp. 98–100) "Such a general, step-authorizing statement is called a warrant … the difference between grounds and warrants (facts and rules) is a *functional* difference." (Toulmin et al. 1984, pp. 46–47; italics in original).

from grounds to a claim which is being established; the difference in function could be "hinted at", Toulmin coyly claims, by expanding the sentence to read in the first case "Whoever is a child in this class has been found to have been vaccinated" and in the second case "Whoever is found to be a child in this class you may take to have been vaccinated" (Toulmin et al. 1984, pp. 47–48; Toulmin 1958, p. 99).

Toulmin's concept of warrant has parallels in theoretical discussions of reasoning. It corresponds to what Charles Sanders Peirce calls a "leading principle" of a class of inferences, which he defines as a proposition related to a habit of inference which states that every proposition *c* which is related in a given general way to any true proposition *p* is true (Peirce 1955, p. 131). Similarly, it corresponds to what John Pollock calls a "reasoning scheme" or "reason-schema" (Pollock 2001, p. 243). The concept of an argumentation scheme derived from the work of Perelman and Olbrechts-Tyteca (1958) is similar. Toulmin's warrants, Peirce's leading principles, Pollock's reason-schemas and Perelman's argumentation schemes are all general principles in accordance with which we reason or argue. They are not grounds from which we argue. The distinctive contribution of all four theorists is their claim that the rules by which we draw conclusions from reasons, or support claims with reasons, are in general not purely formal but substantive.

Neither Peirce nor Pollock justifies their assertion that our reasoning proceeds in accordance with such implicit principles; they seem to take this as a fact evident to all those who reflect on their own reasoning. Perelman and Olbrechts-Tyteca cite numerous examples from the western rhetorical and literary tradition to support their taxonomy of argumentation schemes. Toulmin's only justification for distinguishing warrants from the other components of arguments is that they are responses to a different question from a challenger. He provides no justification for his claim that an adequate response to the question, "How do you get from your grounds to your claim?" must be a general hypothetical statement rather than a particular one confined to the specific case. If one were to construct such a justification from the hints he gives, it might be that one needs to be able to justify the warrant independently of the particular case to which it is applied, and that such an independent justification can only come if it makes no reference to the particular case, i.e. is general.

6.2 Misconceptions

6.2.1 A Warrant Is not a Kind of Premiss

In some of the textbook literature, warrants and grounds are presented as two different types of premisses. This attempt to fit Toulmin's scheme into traditional terminology is radically misconceived. Toulmin himself explicitly presents his distinction between grounds and warrant as a replacement for the traditional distinction between minor premiss and major premiss: "Is there even enough similarity

between major and minor premisses for them usefully to be yoked together by the name of 'premiss'?" (Toulmin 1958, p. 96). His negative answer to this question emerges in his subsequent distinction of warrants from grounds, with no proposal of a common genus, and is reflected in the complete absence of the word "premiss" from both editions of his textbook.

In order to decide whether a warrant is a premiss, we would have to clarify what we mean by the word "premiss". The word, and its Latin and Greek ancestors, have a long history in the western logical tradition, going back to Aristotle's word *protasis* (*Topics* 101b15-16 [Aristotle 1984/c. 350 BCE]). In this tradition, a premiss is that *from which* an argument starts, i.e. that *from which* the conclusion is presented as following. If we ask which component or components in Toulmin's scheme fit the traditional meaning of the word "premiss", the answer is quite clear: Toulmin's grounds are premisses in the traditional sense, propositions from which the claim is presented as following, but no other component of Toulmin's scheme is a premiss. In particular, a warrant is not a premiss. The claim is not presented as following from the warrant; rather it is presented as following from the grounds *in accordance with* the warrant. A warrant is an inference-licensing rule, not a premiss.

6.2.2 A Warrant Is not an Implicit Premiss

It follows immediately that the warrant is not an implicit premiss. It is true that warrants are implicit, at least in Toulmin's initial formulation: "data are appealed to explicitly, warrants implicitly." (Toulmin 1958, p. 100) But, as already argued, they are not premisses. And in fact they may be explicit, according to Toulmin's later position in his textbook (Toulmin et al. 1984, pp. 46, 56). It is not their implicitness which distinguishes warrants from grounds, but their functional role.

Toulmin's scheme is completely antithetical to the traditional approach of attributing implicit premisses to arguments. The supposed implicit premiss is on Toulmin's approach not a premiss at all, but a warrant.

It strikes many commentators as a mere verbal difference to call an implicit component of an argument a "warrant" rather than a "premiss". But the distinction is more than verbal. The implicit-premiss approach assumes that a good argument must be either a formally valid argument, or a modally qualified formally valid argument, or a formally inductively strong argument, or an argument possessing some other sort of formal connection adequacy. But arguments which intuitively strike us as quite respectable are not formally correct, in any of these senses. To reconcile their intuitive respectability with the assumption that a good argument has a formally adequate connection between premisses and conclusion, the fiction of an implicit premiss (variously called "hidden", "missing", "tacit", "unexpressed", etc.) is invented. And the problem becomes one of discovering something that is not there. In particular, if one seeks an implicit premiss whose explicitation will produce a formally valid argument, then it can be proved that any such implicit premiss will be at least as strong as the proposition that it is not the case that the premisses

are true and the conclusion false.[2] But this proposition, though a logical minimum, is less strong than the implicit assumption which sophisticated argument analysts attribute to arguments. So one resorts to ad hoc devices to explain and predict this stronger assumption, e.g. the notion of a "pragmatic optimum" (van Eemeren and Grootendorst 1992, pp. 64–68).

Toulmin's concept of a warrant explains immediately why the implicit assumption is stronger than the logical minimum required to produce some sort of formal connection adequacy. The implicit assumption is not an implicit premiss, but the statement of a rule used to infer the conclusion from the premisses (or, in Toulmin's terminology, to license the step from the grounds to the claim). As a rule, it is general. It applies not only to the argument at hand, but also to all arguments similar in the relevant respects. The warrant entitles us to infer (presumptively) not only the British nationality of Harry, but also the British nationality of a host of others born in Bermuda: Jane, Sarah, George, Sam, and so on.

There is another substantive difference between regarding the implicit assumption as an implicit premiss and regarding it as a warrant. When one searches for an implicit premiss, one is looking for something which the argument needs in order to be a good argument or for something which the arguer actually used to generate the conclusion from the premiss(es).[3] In either case, one assumes that there is a unique answer to one's question. The warrant approach, however, needs no assumption of a unique answer to the search for what is implicit in an argument's inference of a conclusion from its explicit grounds. If it is not possible to ask the author of an argument, "How do you get from your grounds to your claim?", the question is better construed as the question, "How might you get there?" And to this question there will in general be a variety of possible answers, varying according to how wide a scope of generalization one assumes and which parts of the content of the argument one abstracts from. As to scope, the warrant Toulmin constructs for his imaginary argument about Harry is limited in scope to human beings; it does not license inferences from the birth in Bermuda of snakes, chickens, cows and other non-human animals to their being British subjects. A broader warrant would equally well license the inference about Harry, but it lacks the required backing. As to the parts of the content from which one abstracts, consider a common argument that marijuana should be legalized because it is no more dangerous than alcohol, which is legal. Among the general rules which would license the step in this argument from the grounds to the claim are the following:

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[2]Proof: Suppose not. Then the implicit premiss is compatible with the opposite, i.e. with the proposition that the premisses are true and the conclusion false. Hence the expanded argument with this implicit premiss made explicit will not be formally valid. QED

I formulate the logical minimum in terms of the negation of a conjunction (construing both negation and conjunction truth-functionally, in the classical sense) rather than in terms of a conditional, because the semantics of the indicative conditional are a matter of dispute. The logical minimum is equivalent to a truth-functionally defined Philonian or "material" conditional.

[3]For the distinction between needed "gap-filling" assumptions and used "gap-filling" assumptions, see (Ennis 1982).

- given that something is no more dangerous than alcohol and that alcohol is legal, then you may take it that that thing should be legalized
- given that something is no more dangerous than something else that is legal, then you may take it that the first thing should be legalized
- given that marijuana is no more dangerous than something that is legal, then you may take it that marijuana should be legalized
- given that one thing is no more dangerous than another which has a certain social status, then the first thing should be given the same social status

and so forth. These possible warrants differ from one another with respect to which parts of the argument's content one abstracts from—"marijuana", "alcohol", "legal" or some combination of these content expressions. The question, then, is not which of these possible warrants the argument actually assumes, for this question has the false presupposition that just one of them is so assumed. The question is rather whether any of these possible warrants is an established warrant, i.e. whether the step from grounds to claim is in fact justified. It is a question of argument evaluation, not a question of argument reconstruction.

6.2.3 *A Warrant Is not an Ungeneralized Indicative Conditional*

Freeman (1991, p. 53) says that for Toulmin warrants are expressible in the form, "If D, then C", where D are the data and C the claim. Taken at face value, this reading misses the generality of warrants, which is one of their key features. For Toulmin, a warrant never has the form, "From these data, you may take it that this claim is true." It always has the form, "From data of this kind, you may take it that a corresponding claim of this sort is true." He may be mistaken in believing that inference-licenses are always general, but this belief is a key part of his conception of a warrant, and it must be respected in presenting his position.

Toulmin does in fact write that warrants are expressible in the form, "If D, then C" (1958, p. 98), but he expressly describes warrants as general, hypothetical statements, as quoted above. And every example of a warrant given in his textbook and accompanying manual is a general statement which covers more than the particular argument of which it is a warrant. To make Toulmin's position consistent, we must construe him as meaning "If D, then C" to express a generalized conditional, generalized over some component content(s) of D and C.[4]

[4]Verheij (2006) describes Toulmin as inconsistent in occasionally seeming to refer to an instance of a conditional statement (i.e. an ungeneralized particular conditional) as a warrant. Verheij notes that elsewhere Toulmin unambiguously emphasizes the generality of warrants.

6.3 Objections

6.3.1 *Difficulty of Practical Application*

Van Eemeren, Grootendorst and Kruiger assert that "it is often difficult in practice to establish … exactly which statements are the data and which statement is the warrant". (van Eemeren et al. 1984, p. 205) They note that the main distinction is supposed to be the difference in function, between providing the basis of the claim and justifying the step from this basis to the claim. Other criteria can be used in combination with the functional one: particularity of the data vs. generality of the warrants, explicitness of the data versus implicitness of the warrants. In practice, they allege, data and warrants "are totally indistinguishable" (van Eemeren et al. 1984, p. 205).

Van Eemeren, Grootendorst and Kruiger do not justify their claim of frequent difficulty in practice of making the distinction. They illustrate it with an invented and rather unrealistic example; the example raises a specific problem which will be the next objection discussed. The way to test a claim that it is difficult in practice to apply a certain theoretical distinction is to take some examples and apply it. I did this for a sample of 50 arguments extracted by random sampling methods from several hundred thousand English-language monographs in the library of a research-intensive university (Hitchcock 2002a). For 49 of the arguments, I had no difficulty in singling out an applicable "inference-licensing covering generalization", as I called it, and distinguishing it from the grounds adduced in explicit support of the claim. The generalization so distinguished was sometimes convoluted and difficult to state in comprehensible English, but that difficulty does not tell against the legitimacy of Toulmin's distinction between data or grounds on the one hand and warrant on the other. On the basis of this sampling, I conclude that the claim of van Eemeren, Grootendorst and Kruiger is false: it is seldom difficult in practice to distinguish the grounds of an argument from its warrant.

6.3.2 *Occurrence of General Statements as Grounds and of Particular Statements as Warrants*

As their illustration of the supposed difficulty of establishing which statements are the data and which statement is the warrant, van Eemeren et al. (1984, p. 205) invent a scenario in which the warrant in Toulmin's hackneyed example functions as the datum and the datum functions as the warrant. Someone says, "Harry is a British subject." Asked "What have you got to go on?", she replies, "A man born in Bermuda is a British subject." Asked "How do you get there?", she replies, "Harry was born in Bermuda." If we follow Toulmin in taking the functional distinction as basic, then the datum is a general statement, not a particular one, and the warrant is a particular statement, not a general one.

This example raises a problem for Toulmin's claim that warrants are general and data or grounds particular. Since Toulmin does allow that a universal statement can function as a datum, he should say that data or grounds are usually particular statements. As to the warrant in the hypothetical example, it is in form a particular statement but in function a general inference-licensing rule. If one takes the step from the datum that a man born in Bermuda is a British subject to the claim that Harry is a British subject, one is using something like the following warrant: Given that a man born in Bermuda has some property *P*, you may take it that Harry has property *P*. (Alternatives are possible: one could limit the scope of the warrant to citizenship status, for example.) This statement has exactly the form of a general inference-licensing rule which Toulmin takes to be most distinctive of a warrant. But it is logically equivalent to the particular statement that Harry was born in Bermuda, as can be proved by deducing each statement from the other.[5] Hence, although the datum in this hypothetical example looks like a particular statement, in its function it is a general rule. The point is quite general: every particular statement is logically equivalent to a general statement. For example, a particular statement in a first-order language of the form "*a* has property *P*" is logically equivalent to the corresponding second-order universal generalization, "For any property *Q*, if everything with property *P* has property *Q*, then *a* has property *Q*." Thus any particular statement can function as a general rule.

Although the hypothetical example of van Eemeren, Grootendorst and Kruiger is unrealistic, examples do occur in which a particular claim is defended by a universal statement. One did, in the sample of 50 arguments mentioned above; it was the one argument of the 50 for which it was difficult to supply a warrant. It occurs in an early 18th century dialogue between two fictional characters who have opposite attitudes to such practices as making the sign of the cross with holy water and wearing surplices, Philatheus opposing them as "Popery" and Timotheus defending them. In the immediate context of the argument extracted by random sampling techniques, Timotheus has characterized the refusal of dissenters like Philatheus to make the sign of the cross with holy water and wear surplices as superstition, on the basis of a mutually agreed definition of superstition as undertaking to make laws of prescribing and refraining in the name of God where God has left us at liberty; Timotheus points out that God has made no laws prohibiting making the sign of the cross with holy water or wearing surplices. Philatheus then says, "I perceive, *Tim<otheus>*, thou resolv'st never to be long in the right: for observe, superstition is to be charg'd upon those, who

[5]From left to right: Suppose that, given that a man born in Bermuda has some property *P*, you may take it that Harry has property *P*. Then in particular, given that a man born in Bermuda was born in Bermuda, you may take it that Harry was born in Bermuda. But obviously a man born in Bermuda was born in Bermuda. Therefore Harry was born in Bermuda.

From right to left: Suppose that Harry was born in Bermuda. Suppose that, for some arbitrary property *P*, a man born in Bermuda has some property *P*. Then Harry has property *P*. By conditionalization, for an arbitrary property *P*, if a man born in Bermuda has some property *P*, then Harry has property *P*. Hence, since *P* was an arbitrary property, if a man born in Bermuda has some property *P*, then Harry has property *P*. QED.

say these things are injoin'd by God, and necessary to religion, when in Truth they are not so." (Oldisworth 1709, p. 141) Here Philatheus claims that Timotheus is in the wrong. He supports his claim with an atemporal universal generalization, in fact an immediate consequence of the agreed definition of superstition. The difficulty presented by this example is that there is no content common to the claim and the supporting ground on which one could generalize to formulate a warrant; that is, there is nothing like the phrase "is a British subject" in the hypothetical example just discussed. The ground can be made relevant to the claim, however, by supposing that the error alleged in the claim is the error of superstition. In that case, the warrant would be: Thou, Timotheus, say'st these things are injoin'd by God, and necessary to religion, when in Truth they are not so. Though a particular statement, this warrant can function as a general rule, since it is logically equivalent to the following second-order generalization: Whatever is true of anyone who says things are enjoined by God and necessary to religion when they are not, is true of Timotheus.

The fact that a first-order particular statement is logically equivalent to a second-order universal generalization, and thus can function as a general rule of inference, enables us to solve a problem for Toulmin's conception of a warrant raised by a number of critics, including Clark (1956), Cowan (1964) and Freeman (1991, p. 51). We sometimes encounter arguments such as, "John will not come to the party, because John won't come if Mary is coming." Here, it is alleged, the explicit premiss has the conditional form characteristic of a warrant, whereas the assumption which licenses the inference—that Mary is coming to the party—is a particular fact of the sort typical of a datum. Freeman takes such examples as showing that it is impossible to determine in the case of some arguments *as products* which statements are data or grounds and which statement is the warrant. (He concedes that in an actual conversation, in which there is a *process* of arguing, one can determine which is which by asking the arguer the questions Toulmin takes to elicit the two types of responses: What do you have to go on? How do you get there?) But in the example it is quite clear what the datum is. The arguer has put forward as support the conditional proposition that John won't come to the party if Mary does. This is probably a particular indicative conditional rather than a general one, but even if it were general ("John never goes to parties to which Mary goes"), it would still be functioning as the datum or ground of the argument. How do we know? Because it is the only proposition cited in support of the claim. The warrant is an implicit covering generalization, which may be expressed in Toulmin's quasi-canonical warrant form as follows: If some proposition p is true if Mary is coming, then you may take it that p is true. And this rule is logically equivalent to the proposition that Mary is coming.[6] To identify this proposition as the warrant is

[6]Proof: Left to right: Suppose that, if some proposition p is true if Mary is coming, then you may take it that p is true. Then, in particular, if it is true that Mary is coming if Mary is coming, then you may take it that Mary is coming. But obviously, if Mary is coming, then it is true that Mary is coming. Hence Mary is coming.

Right to left: Suppose that Mary is coming. Now suppose that an arbitrary proposition p is true if Mary is coming. Then p is true. Hence, by conditionalization, if an arbitrary proposition p is true

quite consistent with Toulmin's characterization of a warrant as a general inference-licensing rule.

6.3.3 *Misconstrual of the Function of Generalized Conditionals in Premissary Position*

Freeman (1991, pp. 53–72) argues at length against what he takes to be Toulmin's claim, that explicit conditional statements which occur in premissary position are to be construed as warrants, not in the traditional fashion as premisses. Consider the argument: "Peter is a Swede; Scarcely any Swedes are Roman Catholics; so, almost certainly, Peterson is not a Roman Catholic."[7] Freeman construes Toulmin as asserting that general categoricals like the second statement in this argument are either summaries of data, in which case they can serve as backing, or permissive warrants which can go beyond the observed data; similarly for generalized conditionals. Toulmin needs to show, Freeman asserts, that open-ended generalizations like "hydrogen atoms have one proton in their nucleus" always function in arguments as warrants when they are in premissary position. Freeman finds Toulmin's arguments for this position inadequate: they either beg the question or rest on false assumptions about the use of words like "every" and "any". Likewise, Ryle fails in an earlier attempt (Ryle 1950) to establish that all hypothetical statements express inference rules (Freeman 1991, pp. 61–68). Freeman notes that Mill anticipated Toulmin's analysis of some universal affirmative categorical propositions as warrants, referring to them as "a memorandum for our guidance" (Mill 1973/1843, p. 180). But Mill also allowed, as does Nagel in his critique of instrumentalism in the philosophy of science (Nagel 1961), that such propositions can be regarded as part of our knowledge of nature, functioning sometimes as premisses. To construe them in such contexts as inference rules is to misconstrue the structure of the argument.

The first thing to note about Freeman's objection is that Toulmin's distinction between data (or grounds) and warrant does not stand or fall with his alleged insistence that all explicit conditionals or universal categorical statements in premissary position are to be construed as warrants rather than premisses. One can allow that explicit conditionals sometimes function as premisses, i.e. in Toulmin's terminology as "data" or "grounds". Here is a realistic example, adapted from a published advertisement about safe driving. Suppose that a driving instructor is

(Footnote 6 continued)

if Mary is coming, then p is true. Hence, in general, if some proposition p is true if Mary is coming, then p is true. QED.

[7]This is Toulmin's example. Freeman actually proposes the example: "If Mary is coming to the party, John won't. Mary is coming to the party. So John won't." But the conditional statement in this argument is not a candidate for a warrant, because it is not general. If someone actually propounded this argument, its warrant on Toulmin's analysis would be purely formal: A true conditional with a true antecedent has a true consequent. This is just *modus ponendo ponens*.

explaining to a class what to do if your car starts to skid on an icy road: take your foot off the gas and turn the steering wheel in the direction of the skid. That will straighten the car out, the instructor might explain, and you can then regain control of the car. "Don't step on the brakes. If you step on the brakes, your wheels will lock. And if your wheels lock, your car won't turn." The claim in the quoted argument is, "Don't step on the brakes." The grounds are quite clearly the two conditionals, which as stated have a general applicability to all students being addressed and to all situations in which the car they are driving starts to skid on an icy road. The warrant is something like: "If your car starts to skid on an icy road, don't do anything that prevents the car from turning."[8] Since the only propositions which play a role in supporting the claim are the three generalized conditionals, at least one of them must function as a ground. And none of these three conditionals is a mere summary of observed data; all have the open-endedness which is characteristic of a warrant. Faced with examples like this, Toulmin must admit that not all open-ended conditionals which are explicit in arguments but are not the claim are warrants; some are grounds.

Such an admission does not undermine the distinction between data or grounds and warrant. It simply shows that explicit generalized conditionals in premissary position are sometimes grounds. This fact of course reopens the first objection above: how are we to tell in a given case whether an explicit open-ended conditional in premissary position is a ground or a warrant? The default position seems to be that anything explicitly adduced in support of a claim is a ground. It takes some specific indication in the text that an explicit generalized conditional or universal categorical proposition is functioning as a warrant to rebut the presumption that it is a ground. One such specific indication, extremely common in mathematical proofs, is the insertion in the argument of a prepositional phrase containing a name of the proposition, as in the sentence: "A certain neighborhood of this invariant set [represented by a closed curve whose equation has just been given–DH] is compact, and therefore, on the basis of Theorem 6, it will follow from the asymptotic stability that this set will be uniformly asymptotically stable and uniformly attracting; …" (Zubov 1964, p. 164)[9] Propositions so cited are conclusions of an earlier proof, as in the present case, where Theorem 6 reads: "An asymptotically stable closed invariant set M of a dynamical system f(p, t), having a sufficiently small compact neighborhood, is uniformly asymptotically stable and uniformly attracting." (Zubov 1964, p. 29) The fact that theorem 6 is cited with the prepositional phrase "on the basis of" (and in other more typical cases by the preposition "by") rather than being stated in full before the conclusion indicator "therefore" shows that it is not functioning as a premiss but as an inference-license, i.e. in Toulmin's terms as a

[8]In what Toulmin calls a "more candid" form: For any propositions p and q, given that your car is starting to skid on an icy road, and your car won't turn if p, and p if you do q, you may take it that you are not to do q. This is logically equivalent to the injunction not to do anything that will prevent your wheels from turning if your car starts to skid on an icy road.

[9]The example comes from the sample of 50 arguments previously mentioned, i.e. from Hitchcock (2002b).

warrant. Another indication is that the generalized conditional occurs after the conclusion has been drawn from a premiss (i.e. datum or ground in Toulmin's terminology) which immediately precedes it, as in the following invented but realistic expression of spousal concern: "You look very tired, so I think you should put off the house-cleaning you were going to do tonight. You shouldn't exert yourself when you are tired." Here the ground is that the addressee looks very tired. The conditional which follows the claim seems to come after the argument has already been stated. It does not sound like an additional piece of information offered in support of a claim, but rather like a justification of the step from the ground to the claim, i.e. like a warrant. Although warrants are usually implicit, this example is typical of those are cases where they are explicit.

6.3.4 Absence of Warrants from Arguments as Products and from Our Conscious Reasoning

Freeman (1991, pp. 81–84) argues that the category of warrant should be jettisoned in analysing arguments as products, on the ground that they are not parts of arguments as products and so not something to be included in argument diagrams. They are not parts of arguments as products, he holds, because they are only implicit in such products and phenomenologically we are not aware of the rules according to which we draw conclusions in our reasoning. This is a strong argument. In laying out the structure and content of an argument, we do well to be faithful to the text we are analysing and to be cautious about adding to, or subtracting from, what is actually said or written (or thought, if we are analysing our own private reasoning). Otherwise, we run a serious risk of distorting the text under examination by understanding it in the light of our own prejudices, a distortion which is to be particularly avoided if we are dealing with a serious argument.

In general, then, the warrant is not part of the analysis of an argument, not something to be included in its diagramming. Identification of the warrant is part of the evaluation of the argument. The evaluative question is: Is there a justified rule of inference in accordance with which the claim/conclusion follows from the data/grounds/premisses/reasons? There may be more than one possible warrant, depending on which repeated content expressions are generalized over and to what extent. Without the opportunity to ask the arguer, "How do you get there?", we must ask, "How could you get there?" and consider whether any of the possible rules of inference which would license the step from premisses to conclusion is in fact justified.

6.3.5 *Difficulty of Assigning Some Warrants to Fields*

Johnson (1996/1981, pp. 129–130) objects that the examples Toulmin gives of warrants are sometimes difficult to assign to a specific field. This is a fair objection to Toulmin's claim that all warrants are field-dependent. Toulmin sometimes writes as if the body of human knowledge is parceled out into fields, each of which comes with its established warrants, which an arguer uses to select grounds relevant to his or her claim. This model fits some arguments well. Construction of a case in law, for example, often proceeds by listing the conditions which jurisprudence in the legal system has determined are individually necessary and jointly sufficient to prove the desired conclusion. Each condition in turn may have established criteria for determining whether it is met. Constructing one's arguments with reference to a hierarchy of such conditions is the well known stasis theory of the rhetorical tradition. But not all arguments can be constructed with reference to the established warrants of a field. Much everyday reasoning, for example, takes place in terms of common-sense knowledge. Suppose that a jealous husband claims that his wife is having an affair, on the ground that he saw her walking to the bus stop with a man from her office (Toulmin 1984, p. 48). His warrant is that a married woman seen walking to the bus stop with a man from her office is having an affair with that man. Besides being of dubious validity, this warrant does not belong to a field with established warrants, analogous to law or science or medicine. It is a generalization (a false one) about human behaviour, but hardly the subject-matter of an organized body of knowledge.

In response to Johnson's objection, we would do well to give up Toulmin's strong field-dependency thesis. Some warrants belong to specialized fields, but some are just generalizations, more or less rough-and-ready, based on common experience. Sometimes we construct arguments by selecting data which established warrants indicate are relevant to our claim. Sometimes, however, as in medical diagnosis, we draw a conclusion from the data we observe, and can only with difficulty articulate our warrants, or even our data, afterwards; expert diagnosis is often intuitive and not readily expressible in words.

Qualification of Toulmin's field-dependency thesis, however, does not refute his claim that an argument's grounds are distinct from its warrant.

6.4 Summary

An argument whose function is to justify a claim does so by providing grounds in support of this claim; we may also call these grounds reasons or data, and we may if we wish retain the traditional labels "conclusion" and "premisses" for the two components. Implicit in any such argument is the claim that the claim follows from the grounds. It does so if and only if there is some justified covering generalization of the argument, possibly qualified as holding "generally" or "presumably". Any

such justified covering generalization is what Toulmin means by a "warrant". Warrants are not premisses, and in particular they are not implicit premisses. And they are not merely the particular assumption that the claim is true if the grounds are; they are general.

Objections against the practical applicability of the distinction between warrants and grounds often rely on invented, decontextualized, unrealistic examples of "arguments", which are irrelevant to the question of applicability to real arguments. The distinction was quite easy to draw for a sample of 50 arguments selected by random sampling methods from English-language monographs in a research-intensive university. Examples where the stated grounds are generalizations and the implicit assumption a particular statement are quite consistent with Toulmin's claim that warrants, which are usually implicit, are general, for every particular statement is logically equivalent to a universal generalization of the next order. Explicit conditionals in premissary position, even open-ended ones, must be presumed to be grounds, perhaps contrary to Toulmin's own position; the existence of realistic arguments in which all supporting statements are open-ended generalized conditionals proves that such conditionals are sometimes grounds. The presumption that explicit conditionals in premissary position are grounds can be defeated by textual indications that they function as warrants. The implicitness and frequent indeterminacy of the warrants for arguments as products show that warrants are generally not components of arguments, to be included in their reconstruction or in a diagram of their structure. Questions about an argument's warrant arise when one comes to evaluate it, and in particular to evaluate whether its conclusion follows from its stated premiss(es). The question is not "How do you get there?" but "How might you get there?" And then: "Is one of the ways you might get there a reliable route?" Less metaphorically, is there a justified covering generalization? If so, then the inference is warranted; if not, it is not.

Toulmin's field-dependency thesis needs qualification. Many warrants belong to definite fields, in which there is an organized body of knowledge. But many do not. Some are common-sense generalizations. Others are purely formal.

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Chapter 7
Non-logical Consequence

Abstract Contemporary philosophers generally conceive of consequence as necessary truth-preservation. They generally construe this necessity as logical, and operationalize it in substitutional, formal or model-theoretic terms as the absence of a counterexample. A minority tradition allows for grounding truth-preservation also on non-logical necessities, especially on the semantics of extra-logical constants. The present chapter reviews and updates the author's previous proposals to modify the received conception of consequence so as to require truth-preservation to be non-trivial (i.e. not a mere consequence of a necessarily true *implicatum* or a necessarily untrue *implicans*) and to allow variants of the substitutional, formal and model-theoretic realizations of the received conception where the condition underwriting truth-preservation is not purely formal. Indeed, the condition may be contingent rather than necessary. Allowing contingent non-trivial truth-preservation as a consequence relation fits our inferential practices, but turns out to be subject to counterexamples. We are left with an unhappy choice between an overly strict requirement that non-trivial truth-preservation be underwritten by a necessary truth and an overly loose recognition of non-trivial truth-preservation wherever some truth underwrites it. We need to look for a principled intermediate position between these alternatives.

7.1 Consequence in Contemporary Philosophy

In contemporary philosophy, consequence is generally construed as necessary truth-preservation. A conclusion is said to follow from the premiss(es) from which it is drawn if and only if it is necessary that, if the premiss or premisses are true, then the conclusion is also true (Tarski 2002/1936a, b, pp. 178, 183–184; Salmon 1963, p. 18; Etchemendy 1990, pp. 81–82; Forbes 1994, p. 3, Copi and Cohen

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2001, p. 43; Hurley 2006, p. 41; Jeffrey 2006, p. 1). Equivalently, it is impossible for the conclusion to be untrue while the premiss(es) are true.[1]

The impossibility in question is most commonly construed as logical or formal, meaning that the form of the conclusion and the premiss(es) rules out the combination of an untrue conclusion with true premiss(es). The application of this conception to reasoning and arguments in a natural language requires that the sentences of the language be regimented into a "canonical notation" (Quine 1960), which can then if desired be recast in a formal language whose extra-logical constants may be in themselves uninterpreted. For example, the logical operation of conjunction, indicated in English by the word 'and', is commutative, in the sense that, from the conjunction of one sentence with a second sentence, there follows the conjunction of the second sentence with the first.[2] Thus, from 'Snow is white and grass is green' there follows 'Grass is green and snow is white'. But one cannot apply this principle directly to all English-language sentences in which the word 'and' is the main connective joining two clauses. To take a mildly scatological example, the situation in which a man pulls down his pants and pees is different from the situation in which he pees and pulls down his pants. What needs to be made explicit in regimenting the sentence 'he pulled down his pants and peed' is that in English a sequence of two tensed clauses joined by 'and' implicitly claims that the event or state of affairs described in the first-mentioned clause precedes the event or state of affairs described in the second-mentioned clause. In canonical notation, the sentence might be recast as follows: In some time interval *k* before now he pulls down his pants, and in some time interval *l* before now he pees, and *k* precedes *l*. With this explicitation, any sentence obtained by permutation of the clauses of the recast sentence that are joined by 'and' follows from it.

7.2 Tarski's Conception of Consequence

Although the necessity in the condition of necessary truth-preservation is most commonly construed as logical necessity, there is a minority philosophical tradition —whose members include Bolzano (1972/1837), Peirce (1955/1877), Sellars (1953), Ryle (1960/1954), Toulmin (1958), George (1972, 1983), and Brandom (1994, pp. 97–104; 2000, pp. 52–55)—that construes it as including other kinds of necessity as well. Perhaps surprisingly, Alfred Tarski can be counted as a member of this tradition. In his classic paper "On the concept of following logically", Tarski lays down the following necessary condition (F) for the material adequacy of an

[1] I write 'untrue' rather than 'false', in order to leave open the possibility of a conclusion's being neither true nor false.

[2] For simplicity, I am taking sentences to be the relata of the consequence relation. Nothing in this article should depend on this decision. The same points about consequence could be made if one takes entities other than sentences to be the primary truth-bearers—e.g. utterances, statements or propositions.

account of what it is for a sentence X to follow logically from the sentences of a class $\mathfrak{K}$:

> (F) If in the sentences of the class $\mathfrak{K}$ and in the sentence X we replace the constant terms which are not general-logical terms correspondingly by arbitrary other constant terms (where we replace equiform constants everywhere by equiform constants) and in this way we obtain a new class of sentences $\mathfrak{K}'$ and a new sentence X', then the sentence X' must be true if only all sentences of the class $\mathfrak{K}'$ are true. (Tarski 2002/1936a, b, pp. 183–184; italics in original)[3]

Tarski's condition (F) in fact combines two conditions, which he articulates separately before stating condition (F). The first condition is the condition of necessary truth-preservation, stated quite generally in a way that does not restrict consequence to logical consequence:

> …it cannot happen that all the sentences of the class $\mathfrak{K}$ would be true but at the same time the sentence X would be false. (Tarski 2002/1936a, b, p. 183)

This condition combines an impossibility condition ("cannot") with a co-temporality condition ("at the same time"). Tarski does not explain what he means by either of these conditions. Given that Tarski's focus was on deductive mathematical theories, whose sentences do not change their truth-value over time, the co-temporality condition "at the same time" is most plausibly construed as a metaphor for co-situatedness, "in the same situation" or "in the same circumstances". That is, Tarski is claiming that what cannot happen when a sentence X is a consequence of all the sentences of a class $\mathfrak{K}$ is that, given one and the same situation, all the sentences of the class $\mathfrak{K}$ are true but the sentence X is false. As for the impossibility condition, I have argued (in Tarski 2002, pp. 168–170) that it is the condition that there are no circumstances in which both the implying sentences are true and the implied sentence false. On this interpretation, the impossibility condition and the co-temporality condition are the same condition: that there is no (possible) situation in which all the sentences of the class $\mathfrak{K}$ are true but the sentence X is false.

Tarski immediately follows his statement of the requirement of necessary truth-preservation with an argument for the following additional requirement for a specifically logical consequence relation:

> … following… cannot be lost as a result of our replacing the names of… objects in the sentences under consideration by names of other objects. (Tarski 2002/1936a, b, p. 183)

As is well known, Tarski argued that this substitutional condition, although necessary for logical consequence, is insufficient, because a language might lack names for the objects that would constitute a counterexample when a sentence X does not

[3]Here and elsewhere, I use the exact translation into English by Magda Stroińska and myself of the Polish version of Tarski's paper (Tarski 1936a), which I argued in (Tarski 2002) is more authoritative than the German version, also written by Tarski (1936b), which was used as the basis of the previous rather inexact translation of the paper into English (Tarski 1956 and 1983, pp. 409–423).

follow logically from the sentences of a class $\mathfrak{K}$. He therefore proposed what became the contemporary model-theoretic conception of logical consequence:

> We say that the sentence *X* follows logically from the sentences of the class $\mathfrak{K}$ if and only if every model of the class $\mathfrak{K}$ is at the same time a model of the sentence *X*. (Tarski 2002/1936a, b, p. 186; italics and extra spaces in the original)

In this definition, Tarski meant by a model a sequence of objects that satisfies a sentential function, a rather different conception than the contemporary notion of a model as an interpretation. In contemporary work in formal logic, formal languages are usually constructed with a distinction between interpreted logical constants (such as the signs signifying logical conjunction and universal quantification) and uninterpreted extra-logical constants. The semantics for such a language specifies what constitutes an interpretation of sentences in the language, which typically includes specification of a domain or "universe of discourse" (a non-empty set of objects) and an assignment to each extra-logical constant of some object defined in terms of the domain (a member of the domain, a subset of the domain, a set of ordered pairs of members of the domain, etc.). A sentence *X* of a language is said to follow logically from the sentences of some class $\mathfrak{K}$ of sentences of the language if and only if every true interpretation of the sentences of the class $\mathfrak{K}$ is also a true interpretation of the sentence *X*. Although not identical to Tarski's conception, this definition captures its spirit in the contemporary framework for formal work.

In his article, Tarski pointed out quite rightly that the scope of logical consequence as thus defined depends on how one divides logical terms from extra-logical terms. In a substitutional conception of logical consequence, the logical terms are those not subject to substitution when searching for a substitutional counterexample—i.e. a parallel argument with true premisses and an untrue conclusion, obtained by uniform substitution on the original argument's extra-logical terms. In a model-theoretic conception of logical consequence, the logical terms are those not needing interpretation in the search for a model-theoretic counterexample—i.e. an interpretation in which the premisses of the argument are true but its conclusion untrue. If all terms are extra-logical, then on either the substitutional or the model-theoretic conception any sentence is a logical consequence only of itself (either alone or in combination with other sentences). If all terms are logical, then on the substitutional conception any true sentence is a logical consequence of any sentences and any sentence is a logical consequence of any class of sentences that are not all true. That is, logical consequence reduces to the so-called "material implication" of medieval logicians (*consequentia materialis*), a relation that holds in all cases except those in which the sentences of the class $\mathfrak{K}$ are true but the sentence *X* is untrue. Tarski made the same claim about his version of the model-theoretic conception (2002/1936a, b, pp. 188–189). I argued in (Tarski 2002, p. 171) that Tarski's claim can be defended if we suppose that the domain for the language is fixed, as Tarski's article implicitly assumed. On the contemporary model-theoretic conception of logical consequence, however, the domain with respect to which sentences of a formal language are interpreted is not fixed, and so

fixing the interpretation of all terms does not reduce logical consequence to material implication. For example, the sentence 'There are at least two objects' does not follow from the sentence 'there is at least one object', since the first sentence is false but the second sentence true when the domain consists of just one object. Nevertheless, treating all terms as logical, in the sense that their interpretation is fixed for each possible size of the domain (e.g. from one object to denumerably many objects) greatly expands the extension of the concept of logical consequence.

Between the extreme that narrows the extension of logical consequence so that any sentence is a logical consequence only of itself, and the extreme that makes it coextensive with material implication, many intermediate positions are possible. In his 1936 article, Tarski confessed ignorance of any objective basis for dividing logical from extra-logical terms (2002/1936a, b, p. 188), i.e. for selecting a particular intermediate position between the extremes just mentioned. Tarski speculated that no such objective basis might be found, in which case the model-theoretic conception of logical consequence would be relative to a definite but somewhat arbitrary division of the terms of a language into logical and extra-logical terms (pp. 189–190). In his condition (F), Tarski referred to logical terms as "general-logical terms", a locution apparently reflecting his belief at the time that the logical terms are those that occur in all axiomatized deductive theories and in everyday life, whereas extra-logical terms are "specifically metalinguistic" or "specifically mathematical" (Tarski 2002, pp. 161–162). In later work (Tarski 1986/1966), Tarski proposed that the logical terms are those denoting notions that are invariant under all transformations of a domain into itself. For example, no name of an individual object in a domain is a logical term, because one can always transform any domain into itself in such a way that an arbitrarily selected individual member of it becomes another individual object. On the other hand, terms signifying the universe class and the empty class are logical, because their denotation remains the same under any transformation of any given domain into itself. Other logical "notions", as Tarski calls the denotation of logical terms, are the relations of identity and non-identity between individuals, the cardinality of classes of individuals, and the relations of inclusion, disjointness and overlap between classes (Tarski 1986/1966, pp. 150–151). But the criterion of invariance under transformations of a domain into itself, objective as it is, allows for some terms to be logical terms in one language but extra-logical in another. As Tarski points out (1986/1966, pp. 152–153), set membership is a logical notion if set theory is constructed in the fashion of Whitehead and Russell's *Principia Mathematica* via a higher-order logic involving a theory of types, but a non-logical notion if set theory is constructed in the fashion of Zermelo in a first-order logic in which a single domain includes individuals, classes of individuals, classes of classes of individuals, and so on. The ambiguous status of set membership leaves indeterminate the question of whether mathematical notions are logical notions, since set theory is basic to mathematics and all the notions of set theory can be defined in terms of set membership with the help of logical notions.

7.3 Extending Tarski's Condition F to Non-logical Consequence

However the line is drawn between the logical and the extra-logical terms of a language, one can modify Tarski's condition (F) so as to permit some extra-logical terms to be treated as if they were logical. That is, in the search for a counterexample, these terms would not be subject to substitution (on a substitutional approach) or to variant interpretations (on a model-theoretic approach). The revised condition (F′) might be written as follows:

> (F′) If in the sentences of the class $\mathfrak{K}$ and in the sentence X we replace some or all of the constant terms which are not logical terms correspondingly by arbitrary other constant terms (where we replace equiform constants everywhere by equiform constants) and in this way we obtain a new class of sentences $\mathfrak{K}'$ and a new sentence X', then the sentence X' must be true if only all sentences of the class $\mathfrak{K}'$ are true.

In a more contemporary idiom, we might phrase the condition as follows:

> (F″) For some non-empty subset of the extra-logical constants in the sentences of the class $\mathfrak{K}$ and in the sentence X, if uniform substitution on these constants produces a new class of sentences $\mathfrak{K}'$ and a new sentence X', then the sentence X' must be true if all the sentences of the class $\mathfrak{K}'$ are true.

The requirement that the set of substitutable extra-logical constants be non-empty is meant to rule out treating the "material implication" of medieval logicians as a consequence relation. Intuitively, the mere fact that it is not the case that all the sentences of the class $\mathfrak{K}$ are true and the sentence X is untrue does not suffice to make X follow, even non-logically, from the sentences of the class $\mathfrak{K}$; for example, nobody would suppose that 'grass is green' follows from 'snow is white'.

The revised condition (F″) is a generalization of Tarski's condition (F), which then becomes the special case in which necessary truth-preservation continues to hold when substitution is allowed on the entire set of extra-logical constants. In general, however, application of (F″) would require multiple tests to see whether an argument met it. Take the hackneyed standard philosopher's example, 'Socrates is human, so Socrates is mortal', which we might put into a regimented language as 'HUMAN(Socrates), so MORTAL(Socrates)', where the extra-logical constants are the one-place predicates 'HUMAN' and 'MORTAL' and the name 'Socrates' and there are no logical constants. We have seven non-empty subsets of these extra-logical terms with respect to which condition (F') might be met: {'HUMAN'}, {'MORTAL'}, {'Socrates'}, {'HUMAN', 'MORTAL'}, {'HUMAN' 'Socrates'}, {'MORTAL', 'Socrates'} and {'HUMAN', 'MORTAL', 'Socrates'}. Treating condition (F) as a necessary condition for logical consequence, we find that the conclusion that Socrates is mortal is clearly not a logical consequence of the premiss that Socrates is human, since condition (F″) is not met when all the extra-logical constants are subject to substitution, i.e. with respect to {'HUMAN', 'MORTAL', 'Socrates'}. In particular, substitution of 'PERSIAN' for 'MORTAL' produces an argument in which the premiss is true but the conclusion false, showing

that the conclusion of this parallel argument need not be true when its premiss is true (since what is actually not the case is not necessarily the case). The same counterexample shows that the conclusion is not a consequence of the premiss with respect to any set of extra-logical constants that includes the predicate 'MORTAL'. On the other hand, since the conclusion is true, no substitution solely for 'HUMAN' will produce a parallel argument with a true premiss and an untrue conclusion, so that we cannot so easily show that the conclusion does not follow with respect to the set {'HUMAN'}. Here one needs to fall back on intuitive judgments of necessity, looking for a substitution for 'HUMAN' on which the premiss, though true, clearly does not necessitate the truth of the conclusion. For example, it is true that Socrates weighs more than a kilogram, but intuitively it is not necessary that Socrates is mortal if Socrates weighs more than a kilogram. The name 'Socrates' might for example refer to a large boulder, one that weighs more than a kilogram, but boulders are not mortal: since they are never alive, they never die. A similar reflection shows that the conclusion does not follow with respect to the set {'HUMAN' 'Socrates'}, since we can substitute a name of the aforesaid boulder for the name 'Socrates'. The remaining option is that the conclusion follows with respect to the set {'Socrates'}. Here we find not only that no substitution on 'Socrates' produces an argument with a true premiss and an untrue conclusion, but also that it is plausible to hold, in a way that it was not when we substituted for 'HUMAN', that, if the parallel argument has a true premiss then the conclusion must be true. That is, it is not just true as a matter of fact that, if someone is human, that individual is mortal, but it is a matter of necessity. Intuitively, this necessity is not logical, since there is no specifically logical inconsistency in supposing that a particular human being is immortal. Nor does the necessity seem semantic, since the postulation of an immortal human being, say in a work of science fiction, does not seem to involve a confusion about the meaning of terms, in contrast to the way in which the postulation of a married bachelor would involve semantic confusion. Rather, the necessity seems to be physical, or more specifically physiological. Human beings inevitably undergo a process of aging that eventually results in death due to failure of one or more of their life-support systems (circulatory, respiratory, excretory, etc.) if they do not die earlier from some other cause.[4]

The need to appeal in applications of condition (F″) to intuitive judgments of necessity is a weakness, since one person may come to a different judgment than another as to whether a particular conditional is necessary. Without stated criteria of necessity, it is impossible to resolve such differences of intuitive judgment rationally, except by inviting the disputants to reconsider their judgments or to take notice of the considered judgments of others about the necessity of the conditional in question. Tarski solved this problem by abandoning the requirement that truth-preservation be necessary. His model-theoretic conception of logical

[4]At least, so we suppose. Research on aging may lead to techniques of preventing human aging, in which case human immortality would become physiologically possible. But the "may" here is epistemic. At the moment, as far as we know, it is physiologically inevitable that every human dies.

consequence simply specifies that every model (i.e. true interpretation) of the input sentences is also a model (true interpretation) of their logical consequence. Interpretations are constructed with reference to the world as it is, not to the world as it might be.

In *The Concept of Logical Consequence* (1990), John Etchemendy objected that Tarski's reduction of logical consequence to the simple truth of a universal generalization both undergenerates and overgenerates consequences. Even where it gives the right result, he claimed, it does so for the wrong reason. Etchemendy even accused Tarski of committing what he called "Tarski's fallacy", inferring from the necessary truth of a conditional the necessary truth of its consequent given the truth of its antecedent. Specifically, Tarski claims (2002/1936a, b, pp. 186–187) that, if a sentence follows logically in his sense from true sentences, then it must be true. Rephrased in contemporary terms, the claim would be that a sentence that is true on every interpretation on which one or more sentences are true must be true on any interpretation on which the latter sentences are true. Or, to put it in the form of an argument:

> Sentence *X* is true in every interpretation in which the sentences of class $\mathfrak{K}$ are true.
>
> Therefore, if the sentences of class $\mathfrak{K}$ are true in an interpretation, then the sentence *X* must be true in that interpretation.

It is not obvious that this argument is valid, since its premiss is assertoric and its conclusion is apodictic. What licenses the transition from a claim about how things are as a matter of fact to how things must be? Defenders of Tarski's claim, such as Sher (1996), have argued that, because all the extra-logical constants in the sentences are subject to reinterpretation, and variation of the domain is possible, the absence of a counter-interpretation is not just a matter of empirical fact, but a matter of logical necessity. Sher's argument for this claim depends on an appeal to set theory, which thus becomes in a certain sense prior to logic.

It is thus possible to defend the claim, ubiquitous in contemporary work in logic, that absence of a counter-interpretation is a matter of necessity and not just a matter of fact.

What about a similar claim for extensions of the model-theoretic conception to non-logical consequence?

7.4 Revision and Expansion of Substitutional, Formal and Model-Theoretic Conceptions of Consequence

In previous work (Hitchcock 1998), I proposed a revision of the existing generic conception of logical consequence and an extension of the revised generic conception to cover what I there called, following George (1972), 'enthymematic consequence'. In the present chapter I shall review and then modify that proposal, in the process answering some questions left open in its concluding section.

I begin by distinguishing five specific conceptions of logical consequence that one can find in the literature.[5]

1. According to the *deducibility conception*, a sentence is a logical consequence of one or more sentences if and only if it can be deduced from them in a formal system. The deducibility conception is usually taken to be parasitic on the model-theoretic conception, in the sense that the soundness of a formal system is proved by treating the model-theoretic criterion of logical consequence as the "gold standard" and showing that any sentence deducible from given sentences using the rules of the formal system does follow from them in the model-theoretic sense: if the sentence is deducible, then there is no interpretation on which it is untrue when the given sentences are true. Likewise, the completeness of a formal system is shown by proving that any sentence of the formal language is deducible from one or more sentences if it is true in any interpretation that makes that sentence or those sentences true.[6] The deducibility conception can however be taken as basic if one takes the meaning of a sentence to be what it implies, as proposed by Gentzen (1969/1935) in his formulation of natural deduction systems and sequent calculi with a pair of rules for each logical constant, a so-called "elimination rule" indicating what one may deduce from a sentence in which that constant is the main logical operator and a correlative "introduction rule" indicating what one may deduce such a sentence from. Gentzen's proposal has been elaborated and extended from logical constants to all terms by Wilfrid Sellars (1953) and Robert Brandom (1994, 2000) in what Brandom calls "inferential semantics". We will return to the Sellars-Brandom proposal later.

2. According to the *modal conception*, articulated for example by Read (1994), an argument's conclusion follows logically from its premisses if and only if there is no possible situation where the premisses are true and the conclusion untrue. The modal conception is identical to the conception of consequence as necessary truth-preservation identified at the beginning of the present chapter. Proponents of this conception are distinguished from proponents of the other four conceptions now being distinguished in their willingness to apply the conception directly rather than giving an account of it in terms of deducibility or some other relation. The modal conception can account for cases where a conclusion follows necessarily from given premisses, even though it does not follow formally. That is, it is not deducible from them in a formal system, nor does it follow if substitution or (re-) interpretation is allowed on all extra-logical constants. Thus the conclusion of the argument 'Iain is a bachelor, so Iain is unmarried' follows from its premiss, because the meanings of the terms 'bachelor' and 'unmarried' rule out any situation in which the premiss is true and the conclusion untrue. Read (1994, p. 257) explicitly

[5]The description of these five conceptions and my remarks about them incorporate material from pages 20–24 of (Hitchcock 1998), which appears in Chap. 5 of the present volume (pp. 64–68).

[6]*Correction in the present republication*: The original article had a definition of the soundness of a formal system rather than of its completeness.

argues against the claim that the conclusion of this argument only really follows when a 'suppressed premiss' that all bachelors are unmarried is made explicit. The modal conception requires clarification of what sense of 'possible' is involved. Its proponents seem to intend a sense which is relative to the meaning of an argument's component sentences. So their conception might be reworded more precisely as the notion that an argument's conclusion follows from its premiss(es) if their meaning is incompatible with there being a situation where the premisses are true and the conclusion untrue. If so, the modal conception coincides in its extension with the Sellars-Brandom proposal for an inferential semantics. However, it is possible to embrace the modal conception without making the deducibility relationships of a sentence semantically prior to its truth-conditions.

3. On the *substitutional conception*, a conclusion is a logical consequence of given premisses if and only if there is no substitution on its extra-logical constants which produces an argument with true premisses and an untrue conclusion. This conception stems ultimately from Bolzano (1972/1837), who according to George's reconstruction (1972, 1983) accommodated not only logical consequence but also enthymematic consequence, by allowing substitution on some but not all extra-logical constants. Bolzano's version of the substitutional conception is immune to Tarski's objection that a language might lack names for objects that would constitute a counterexample, because Bolzano postulated a realm of abstract ideas on which substitutions were to be made. However, Quine has argued that the substitutional conception of logical truth is equivalent to the model-theoretic conception, provided that the language used for substitution is rich enough for elementary number theory (Quine 1970, pp. 53–55). Presumably his argument would apply as well to a comparison between the substitutional and the model-theoretic conceptions of logical consequence.

4. On the *formal conception*, a conclusion follows logically from given premisses if and only if the argument is an instance of a form of argument which has no instances with true premisses and an untrue conclusion. A form of argument is a linguistic schema which includes at least one meta-linguistic variable but no extra-logical constants and from which an argument can be derived by replacing all occurrences of each variable with the same extra-logical constant or grammatically parallel complex content expression. The formal conception is open to the same objection from the possible poverty of a language as the substitutional conception, and can make use of the same reply.

5. On the *model-theoretic conception*, a sentence *X* follows logically from given sentences if and only if every true interpretation of those sentences is also a true interpretation of the sentence *X*. As pointed out earlier, this conception is standard in contemporary work in formal logic.

All five conceptions give rise to two paradoxes, which are in fact generic problems with the conception of the consequence relation as one in which it is impossible for the premisses to be true and the conclusion untrue. If the word 'and'

in this standard conception is construed as expressing truth-functional conjunction, then this conception implies that any conclusion at all follows from premisses which cannot all be true: if it is impossible for the premisses to be true, then it is a fortiori impossible for the premisses to be true and the conclusion untrue. Thus the sentence 'Amsterdam is the capital of Canada' would follow from the sentences 'There are living organisms beyond the planet earth' and 'There are no living organisms beyond the planet earth'. Intuitively, however, it does not follow, since the sentences about extra-terrestrial life have nothing to do with whether Amsterdam is the capital of Canada. The medieval rule of inference *ex falso quodlibet* ('from a falsehood anything follows') should be rejected. Similarly, the standard generic conception implies that any conclusion which must be true (i.e. cannot be untrue) follows from any premisses whatever: if it is impossible for the conclusion to be untrue, then it is a fortiori impossible for the premisses to be true and the conclusion untrue. Thus the sentence 'whenever it is raining, it is raining' would follow from the sentence 'The Hague and Amsterdam are capitals of the Netherlands'. Intuitively, however, it does not follow, since the sentence about the capitals of the Netherlands has nothing to do with the weather. The medieval rule of inference *ex quolibet verum* ('from anything a truth follows') should likewise be rejected.[7]

One could avoid these paradoxes by adding two requirements for consequence, that it is possible that all the premisses are true and that it is possible that the conclusion be untrue. This strategy, however, would introduce new paradoxes, by barring a set of sentences that cannot all be true from having any consequences and barring any sentence that must be true from being a consequence of any set of sentences. Intuitively, impossibilities do have consequences, and necessities can be consequences. For example, any sentence is a consequence of itself, even if it cannot be true or must be true. To avoid the new paradoxes, one needs to introduce the concept of a content expression, which I first used in (Hitchcock 1985). A content expression is an expression in a sentence that can be replaced by an extra-logical constant without loss of grammaticality. Content expressions may themselves be extra-logical constants, in which case they are atomic content expressions. Otherwise they are molecular content expressions. A whole sentence is a content expression, assuming that one's language possesses sentence constants. A conjunctive predicate like 'square and circular' is a content expression. And so forth. We also need the concept of a set of content expressions that exhausts the extra-logical constants in a set of sentences, in the sense that replacement of these content expressions in the sentences in question produces a set of sentence schemata in which there is no extra-logical constant (cf. Hitchcock 1998, pp. 25–26).

With the concept of a content expression, we can redefine the substitutional, formal and model-theoretic conceptions of logical consequence so as to avoid both pairs of paradoxes.

[7]The preceding paragraph summarizes and adapts (Hitchcock 1998, pp. 24–25).

3′. On the *revised substitutional conception*, a sentence X is a logical consequence of the sentences of the class $\mathfrak{K}$ if and only if there is an exhaustive set of content expressions in these sentences on which no uniform substitution produces an untrue sentence X' and a class $\mathfrak{K}'$ of true sentences, at least one such substitution produces a class $\mathfrak{K}''$ of true sentences, and at least one such substitution produces an untrue sentence X'''.

4′. On the *revised formal conception*, a sentence X is a logical consequence of the sentences of the class $\mathfrak{K}$ if and only if they are instances of a set of sentence schemata in which there are no extra-logical constants and for which no instance consists of an untrue sentence X' and a class $\mathfrak{K}'$ of true sentences, at least one instance includes a class $\mathfrak{K}''$ of true sentences, and at least one instance includes an untrue sentence X'''. This conception is essentially that advanced by Smiley (1959, p. 240).

5′. On the *revised model-theoretic conception*, sentence X is a logical consequence of the sentences of the class $\mathfrak{K}$ if and only if there is a an exhaustive set of content expressions in these sentences for which no interpretation produces an untrue sentence X’ and a class $\mathfrak{K}'$ of true sentences, at least one interpretation produces a class $\mathfrak{K}''$ of true sentences, and at least one interpretation produces an untrue sentence X''. The concept of an interpretation can be redefined so that interpretations assign objects to content expressions as wholes, or alternatively one can allow replacement of molecular content expressions in the set by extra-logical constants of the same grammatical type and apply the model-theoretic definition to the sentences thus constructed.[8]

All three conceptions imply a relevance condition of topical overlap between implying sentences and implied sentence. That is, if the implied sentence X contains an extra-logical constant, there is at least one extra-logical constant that occurs both in the sentence X and in at least one sentence of the class $\mathfrak{K}$.[9]

Development of these revised conceptions of logical consequence permits their natural extension to non-logical consequence, simply by dropping the requirement in each definition that the set of content expressions be exhaustive. Logical consequence would then be just the special case in which the set with reference to which the definition is met subjects all the extra-logical constants in the sentences, either directly or by their inclusion in a molecular content expression in the set, to substitution or replacement by another instance or (re-)interpretation. It should be noted that the additional clauses in the definitions, added to rule out the paradoxes of *ex falso quodlibet* and *ex quolibet verum*, automatically rule out so-called

[8]These revised conceptions adapt the conceptions found in Hitchcock (1998, p. 26), with the additional constraint that the set of content expressions is exhaustive.

[9]For a proof with respect to Bolzano’s substitutional conception, applied to the language of classical propositional logic, see George (1983). The qualification that the implied sentence contains an extra-logical constant is needed to accommodate cases where the consequence relation obtains but the implied sentence contains no extra-logical constants. For example, the sentence ‘there is at least one object’ follows from the sentence ‘there are at least two objects’ on any of the three revised conceptions, even though it contains no extra-logical constants.

'material implication' (the medievals' *consequentia materialis*) as a consequence relation. For, if there are extra-logical constants in the sentence *X* or the sentences of the class $\mathfrak{K}$, then the mere fact that we do not have the sentences of $\mathfrak{K}$ true and sentence *X* untrue is not sufficient for consequence on any of the revised conceptions. For, if the set of content expressions with respect to which the criterion for consequence is to be applied is empty, then either the clause requiring *X* to have an untrue parallel will fail or the class requiring the sentences of the class $\mathfrak{K}$ to have parallel sentences that are all true will fail. That is, the only parallel in this case for *X* is *X* itself and the only parallel sentences of the sentences of the class $\mathfrak{K}$ are those sentences themselves. But, by hypothesis, either *X* is true or not all the sentences of the class $\mathfrak{K}$ are true, or both.[10]

The revised conceptions of consequence thus make it easier to test for non-logical consequence. It is necessary to consider only sets of content expressions that include at least one expression common to a premiss and the conclusion of an argument. As a matter of heuristics, the best strategy to use in seeking consequence-implying content expressions in an argument is to generalize as broadly as possible with respect to all the maximal repeated content expressions, whether these are repeated within the premisses or between a premiss and a conclusion. If the conclusion turns out not to follow with respect to this set, one can then try narrower generalizations or smaller sets of content expressions or less maximal content expressions, always retaining at least one content expression common to a premiss and a conclusion (Hitchcock 1985, 1998).

7.5 The Problem of Contingent Non-trivial Truth-Preservation

With this revised and expanded conception of consequence in place, we can return to the question posed earlier: Is consequence a mere matter of fact or also a matter of necessity?

The answer is in fact quite obvious. Not only on the revised and expanded model-theoretic conception just articulated, but also on the parallel substitutional and formal conceptions, there are cases where a sentence *X* is a consequence of the sentences of some class $\mathfrak{K}$ as a mere matter of contingent fact and not as a matter of necessity. For example, no president of the United States of America in the first

[10] *Added in the present republication*: Consider the following arguments: 'Grass is green, so snow is white.'; 'Grass is white, so snow is black; 'Grass is black, so snow is white.' None of these arguments has a true premiss and a false conclusion. Thus their associated material conditional is true. So, with respect to a set of content expressions that does not include any content expression in these arguments, such as the set consisting of the name 'Jupiter', the first condition is met, on any of the revised conceptions of consequence. However, one or other of the two remaining conditions is not met. The second and third arguments have no parallel in which the premiss is true; the first and third arguments have no parallel in which the conclusion is untrue.

230 years of its existence was a woman. This fact is contingent, but it nevertheless underwrites a consequence relation between the sentence 'Abraham Lincoln was president of the United States of America for a period during the first 230 years of its existence' and the sentence 'Abraham Lincoln was not a woman'. For, given the contingent fact, no substitution on the name 'Abraham Lincoln' will produce parallel sentences with the first true and the second untrue;[11] furthermore, the substitution of 'Hubert Humphrey' for 'Abraham Lincoln' produces an untrue parallel to the first sentence and the second sentence is already true. Similarly for the sentence schemata '*x* was president of the United States of America for a period during the first 230 years of its existence' and '*x* was not a woman', and for (re-) interpretations of the name 'Abraham Lincoln'.

Does the contingency of the revised and expanded conception of consequence matter? After all, a contingent fact gives just as strong an assurance of truth-preservation as a necessary connection. Assurance is weakened only if there is some doubt about the truth of the inference-underwriting sentence, but doubt is possible with respect to necessary truths as well as with respect to contingent ones.

Additional support for a consequence relation that can obtain merely contingently comes from the strikingly close match between the covering generalization that underwrites each such consequence and the supposed 'unstated premiss' that skilled argument analysts intuitively supply. For example, application of the revised and expanded conception of consequence to arguments traditionally regarded as incomplete Aristotelian syllogisms will generate a covering generalization, with respect to the term shared between premiss and conclusion, that is logically equivalent in all cases to a sentence whose addition as a premiss would transform it into a complete Aristotelian syllogism. As another example, the revised and expanded conception of consequence was easily applied to all but one of a sample of 50 arguments in scholarly books selected by random methods (Hitchcock 2002).[12]

Furthermore, reinterpretation of a supposed unstated premiss as a claim underwriting a consequence relation explains why the supposed unstated premiss is typically a covering generalization of the stated argument, or something from which such a covering generalization can be derived, rather than the "logical minimum" (Van Eemeren and Grootendorst 1992, pp. 64–67) whose addition as a premiss would make the stated argument formally valid. That logical minimum is the "associated (material) conditional" (Hitchcock 1985) of the argument, the ungeneralized negation of the conjunction of the conjunction of the premisses and the negation of the conclusion. Someone who reasons to a conclusion or adduces

[11] *Correction in the present republication*: The original article had 'true' and 'untrue' reversed.

[12] In testing the applicability of my conception of good inference to actual arguments that scholars advance, I used an even more expanded conception that allowed for probabilistic and presumptive inferences, underwritten respectively by for-the-most-part and ceteris paribus covering generalizations. In the present chapter, I do not discuss this further expansion of the concept of consequence.

evidence as conclusively supporting a claim does more than rule out the combination of true reasons (evidence) and untrue conclusion (claim). Such a person makes a commitment to the same sort of inference in parallel cases, as is shown by the strategy of "refutation by logical analogy", constructing a parallel argument with true premisses and a false conclusion. Thus the person is implicitly using a general rule of inference, which is typically not purely formal. If Mary's mother tells her, "You can't have dessert, because you didn't eat your peas", Mary can quite legitimately reply: "But Johnny got dessert, and he didn't eat his peas." It would be "illogical" for the mother to reply, "I'm talking about you, not about Johnny". She has committed herself to the form of argument, 'x can't have dessert, because x did not eat x's peas', and she must explain why this form of argument does not apply to Johnny when it applies to Mary.

It turns out, however, that acceptance of merely contingent consequence relations has counter-intuitive implications in particular cases. On any of the revised and expanded conceptions of consequence, the sentence 'Napoleon was imprisoned on Elba' follows from the sentences 'Napoleon ruled France' and 'Napoleon was born in Corsica'. For, since Napoleon has been (I am assuming) the only Corsican-born ruler of France, and he was in fact imprisoned on Elba, and many other people have not been imprisoned on Elba, there is no re-interpretation of the name 'Napoleon' on which 'Napoleon was imprisoned on Elba' is untrue but 'Napoleon ruled France' and 'Napoleon was born in Corsica' are true, even though there is a re-interpretation of 'Napoleon' on which 'Napoleon was imprisoned on Elba' is untrue and there is a re-interpretation of 'Napoleon' (namely, the trivial "re-interpretation" on which 'Napoleon' refers to Napoleon) on which 'Napoleon ruled France' and 'Napoleon was born in Corsica' are true. But intuitively, 'Napoleon was imprisoned on Elba' does not follow from the sentences 'Napoleon ruled France' and 'Napoleon was born in Corsica'. The mere fact that Napoleon was born in Corsica and ruled France, we might say, does not count as evidence that he was imprisoned in Elba, does not entitle us to conclude that he was imprisoned in Elba.[13]

An initial response to this difficulty might be to move back from the truth-based conception of consequence to the concept of necessity that it was trying to explicate. Such a strategy would force us to abandon the substitutional and model-theoretic versions of the revised and expanded conception of consequence, and to focus on the formal version. For substitutions and (re-)interpretations shed no new light on whether the clauses of the definition hold necessarily or merely contingently. With the formal version, however, we can ask whether the non-existence of an instance with untrue X and true sentences of a class $\mathfrak{K}$ is a matter of necessity, by asking counterfactually whether there could be such an instance, even if as a matter of fact there is none. That is, we would be testing

[13]The reflections in the preceding paragraph were stimulated by an article by Pinto (2006) and by subsequent correspondence with Pinto and James B. Freeman.

whether the covering generalization is law-like rather than accidental, in a way that would support counterfactual inferences. We can see immediately that our two examples with contingently true generalizations would fail this test. If Walter Mondale had been elected president in 1984 and had died in office, with the result that his running mate Geraldine Ferraro became president of the United States of America, it would not be true that Geraldine Ferraro was not a woman. Similarly, we could tell a variant story of the history of France in which it had a ruler who was born in Corsica but was never imprisoned on Elba; indeed, if by chance some other ruler of France than Napoleon was born in Corsica, it is most unlikely that he would have been imprisoned on Elba.

This strategy takes us back to the difficulty of deciding when non-trivial truth-preservation is a matter of necessity. Sellars (1953) and Brandom (1994, 2000) propose to construe all such necessity as a matter of meaning, and in Brandom's case to get rid of "representational semantics" based on the concept of truth in favour of "inferential semantics" based on the concept of necessary inference. This approach accommodates our practices of reasoning and arguing much better than a formal or logical conception of consequence. But it does so at a cost. First, consequence relations that are most naturally understood as grounded in some physical necessity (such as an object's exercise of gravitational attraction being a consequence of its mass) or legal necessity (such as a person's being at least 35 years of age being a consequence of the person's having been elected president of the United States of America) are implausibly treated as grounded in the meanings of the related sentences.[14] Second, having discarded representational semantics, Brandom is left with nothing to ground our inferential practices except our inferential practices. This strategy flies in the face of our ordinary way of justifying our inferences. If I argue that John F. Kennedy must have been at least 35 years old by the end of 1960, since he was elected U.S. president in November 1960, and you ask me how that follows, I will most naturally point to the provision in section 1 of Article II of the U.S. constitution that "neither shall any person be eligible to that office [of president—DH] who shall not have attained to the age of thirty-five years". It is the fact of this constitutional requirement that grounds the inferential practice that I exemplify in this situation. It would be quixotic to treat the clause in the constitution as a product of our inferential practices.

If we hold on to a representational semantics and treat our inferential practices as grounded in that semantics, then we can rule out merely contingent consequence relations by requiring that the schema in virtue of which X is a consequence of the sentences of some class $\mathfrak{K}$ have no counter-instances not only as a matter of fact but also necessarily. We can leave open-ended the types of necessarily true generalizations that can underwrite a consequence relation, except that we exclude deontic necessities. Any type of necessity that implies actuality will do. Thus the necessity

[14]In the preceding sentence, I use the word 'consequence' in an inferential rather than a causal sense. To be a consequence of something in the inferential sense is to be legitimately inferable from it.

of a true covering generalization that underwrites a consequence relation may be logical, semantic, physical, mathematical, biological, constitutional, and so forth.[15]

By requiring such a true covering generalization to be law-like, supporting counterfactual instances, have we given up too much? Counterexamples in the opposite direction, where the only true covering generalizations are merely contingent but a consequence relation seems to obtain, come to mind. The sentence "Jesus was mortal" seems intuitively to follow from the sentence "All humans are mortal". But the minimal non-trivially true covering generalization for an argument from "All human are mortal" to "Jesus is mortal" is the generalization "If all humans are F, then Jesus is F", which is logically equivalent to the sentence "Jesus is human". And the sentence "Jesus is human" is arguably contingent. Some Christian theologians may take it to be false, supposing that the divinity of Jesus is incompatible with his (full) humanity. Or perhaps Jesus was an alien, and lacked at least one property shared by all human beings.

If such counterexamples are persuasive, they raise the challenge of discovering a principled intermediate position between a very broad consequence relation groundable in merely contingent true covering generalizations and a somewhat narrower consequence relation that requires an inference-licensing covering generalization to be true as a matter of necessity.

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[15] *Added in the present chapter*: Examples of each type: every conditional with a true antecedent has a true consequent; every bachelor is unmarried; every physical object attracts every other physical object with a force proportional to the product of their masses and inversely proportional to the square of the distance between them; the square of the sum of any two numbers is the sum of the square of the first number and twice the product of the two numbers and the square of the second number; every bird is a theropod dinosaur; every president of the United States is a natural-born citizen.

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Chapter 8
Inference Claims

Abstract A conclusion follows from given premisses if and only if an acceptable counterfactual-supporting covering generalization of the argument rules out, either definitively or with some modal qualification, simultaneous acceptability of the premisses and non-acceptability of the conclusion, even though it does not rule out acceptability of the premisses and does not require acceptability of the conclusion independently of the premisses. Hence the reiterative associated conditional of an argument is true if and only it has such a covering generalization, and a supposed unexpressed premiss supplied to make an argument formally valid should be a covering generalization.

8.1 Introduction

As individuals and as communities, we increase our knowledge by making inferences from things we already know. Argumentation involves such inferences, and invites its addressees to accept them. The arguer implicitly claims that the conclusion of each constituent argument follows from the reason or reasons from which it is drawn. What is the general form of such inference claims? What does it mean to say that a conclusion follows from a reason or reasons?

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8.2 Following as Logically Necessary Truth-Preservation: Two Objections

Introductory logic texts nowadays identify following with necessary truth-preservation: if the reasons are true, then the conclusion must be true. See for example Tarski (2002/1936, pp. 178, 183–184), Salmon (1963, p. 18), Etchemendy (1990, pp. 81–82), Forbes (1994, p. 3), Copi and Cohen (2001, p. 43), Hurley (2006, p. 41), and Jeffrey (2006, p. 1). The textbooks go on to explain this necessity as due to a logical form of the argument: if the conclusion follows, it does so because the argument has a contentless form that cannot have an instance with true reasons and an untrue conclusion. (I use the term 'untrue' rather than the usual 'false' so as to accommodate the possibility of a conclusion that is neither true nor false.)

This conception of following, I maintain, is in one respect too broad and in another respect much too narrow.

Too broad It is too broad in counting a conclusion as following merely because the conclusion must be true or merely because the reasons cannot be true. On the contrary, I hold, there must be a connection between the reasons and the conclusion. Consider the following medieval example:

(1) You are sitting and you are not sitting; therefore Tom is in the corner.

Intuitively, the conclusion does not follow. The principle *ex falso quodlibet* (from a falsehood anything follows) is at best dubious. Similarly, consider the following parallel example:

(2) Tom is in the corner; therefore, you are not both sitting and not sitting.

Here too, it seems implausible to hold that the conclusion follows. So the principle *ex quolibet verum* (from anything a truth follows) is also dubious. Rejection of the principles *ex falso quodlibet* and *ex quolibet verum* requires revising standard logic, whether classical or intuitionist. Tennant (1979, 1980, 1984) has shown one way of doing so, although he modifies the relations of deducibility and entailment rather than the relation of following logically. He treats entailment as the converse of deducibility, and then puts restrictions on deducibility that simultaneously restrict the extension of the entailment relation. Thus, in example (1) above, Tennant would say that *Tom is in the corner* follows logically from the premiss *you are sitting and you are not sitting* but is not entailed by it, because it is not deducible from it once restrictions are imposed on what can count as a proof.

If (unlike Tennant) we identify being entailed with following logically, then we can capture the force of Tennant's restrictions by requiring for a conclusion to follow logically that the argument has a form that not only cannot have an instance with both true reasons and an untrue conclusion, but also can have an instance with true reasons and can have an instance with an untrue conclusion. We can label the additional requirement a requirement of *non-triviality*: the ruling out of true reasons

and an untrue conclusion must be non-trivial, in the sense that it must not be due merely to the ruling out of true reasons or merely to the ruling out of an untrue conclusion. Following standard usage in logic textbooks, let us call an argument in which the conclusion follows logically in this sense a *formally valid* argument.

Too narrow The received conception of following is much too narrow in forbidding the form that rules out true premisses and an untrue conclusion to have any content. The restriction to logical or contentless forms seems to be an unwarranted prejudice. If an argument has a form that rules out true reasons and an untrue conclusion in a non-trivial way, then why not admit that the conclusion follows, even if the form has some content?

Consider the hackneyed argument from Socrates' humanity to his mortality:

(3) Socrates is human, so Socrates is mortal.

This argument is an instance of many forms. One of them is the form: *x is human, so x is mortal*. Let us suppose that, as a matter of physiological necessity, every human being will eventually die. Then the form cannot have an instance with a true premiss and an untrue conclusion. But it can certainly have an instance with a true premiss, as in the case of our example, where the name 'Socrates' replaces the variable *x*. And it can have an instance with an untrue conclusion, as when we replace the variable *x* with the name 'seven': seven is not mortal, because numbers are not living organisms and so are not subject to dying. The conclusion that Socrates is mortal thus seems to follow necessarily from the premiss that Socrates is human, even though the necessity in question is physiological rather than formal or even (I would maintain) semantic.

The usual response in the western logical tradition to arguments like that from Socrates' humanity to his mortality is to hold that they have an unexpressed premiss, variously described as 'unstated', 'hidden', 'tacit', 'suppressed' or 'missing'. In the Socrates argument of example (3), an argument analyst would attribute to the argument the unexpressed premiss that every human is mortal. With the addition of this premiss, the argument's conclusion follows purely formally, so the received conception of consequence is vindicated. But of course it is vindicated only because the postulation of an unexpressed premiss presupposes that a conclusion that follows from an argument's premisses must follow purely formally. To use the existence of an unexpressed premiss that every human is mortal as a reason for holding that the conclusion of the Socrates argument follows formally would be to reason in a circle, assuming what is to be proved. Further, it is odd to hold that an argument has a premiss that it does not have. Like the emperor in the fairy tale of Hans Christian Andersen who had no clothes, the Socrates argument does not in fact have as a premiss that every human is mortal. If we look at it carefully, with the eyes of a child uncorrupted by logical indoctrination, we will see that it has just one premiss, that Socrates is human. Further, why would a person omit a premiss of their argument? The usual explanation, going back to Aristotle (*Rhetoric* I.2.1357a16-21 [Aristotle 1984]) and repeated for example by Quine (1972, p. 169), is that arguers omit a premiss for economy of expression, when the addressees can supply the premiss for themselves, as a matter of common knowledge. Much

human linguistic communication is indeed elliptical, relying on context, both linguistic and extra-linguistic, to provide the addressee with what is required to understand what is said or written. But the difficulty with supposing that arguers routinely suppress a premiss that they think belongs to their argument[1] is that we have no awareness of such a supposedly suppressed premiss, even when we are reasoning things out for ourselves (Hitchcock 1985). Readers can check this phenomenological fact directly by reflecting on inferences they make for themselves, immediately after making them. It will readily be discovered both that the inference is not formally valid and that there is no awareness of having omitted a premiss.

Both the reasoning that people use to draw their own conclusions and the arguments that they make to others to support their claims are typically not formally valid. In two collections of arguments selected by random sampling methods, one from books in a university library and the other from calls to phone-in radio and television talk shows, fewer than 10% of the arguments were formally valid, or candidates for being formally valid (Hitchcock 2002, 2010a). In the remaining arguments, the conclusion would follow, if at all, in virtue of a form with content that ruled out true premisses and an untrue conclusion in a non-trivial way. The Socrates argument of example (3), though artificial, is typical in that respect of how we humans reason and argue.

8.3 First Reformulation: Following as Necessary Truth-Transmission

If we adjust the received conception of following as formally grounded necessary truth-preservation so as to accommodate the two objections just mentioned, we get an alternative conception of following as what we might call *necessary truth-transmission*, where the necessity need not be purely formally grounded. On this alternative conception, a conclusion follows from one or more premisses offered in its support if and only if the argument has a form that non-trivially rules out true premisses and an untrue conclusion: no argument of that form can have true premisses and an untrue conclusion, even though an argument of that form can have true premisses and an argument of that form can have an untrue conclusion. The three conditions in this alternative conception can be expressed as conditions on a *covering generalization* of the argument: there is a generalization of the argument's associated material conditional (the truth-functional conditional whose antecedent is the conjunction of the argument's premisses and whose consequent is the argument's conclusion) that is necessarily true, even though it can have an instance with a true antecedent and can have an instance with an untrue consequent.

[1] *Change in the present republication*: In response to an expression of puzzlement by a reviewer, the phrase 'think belongs to their argument' has replaced the phrase 'conceive their argument as having'.

The received conception of consequence as formally grounded necessary truth-preservation can be articulated in substitutional, model-theoretic or schematic ways. To articulate the alternative conception of consequence as necessary truth-transmission in these ways, one permits treatment of extra-logical constants like the name 'Socrates' in the same way as logical constants like the conjunction operator 'and' are treated and one rules out trivial consequences (Hitchcock 1998).

The substitutional, model-theoretic and schematic articulations of the two conceptions each replace the component of necessity in the original conception with a component of universality. The necessity with which truth is preserved or transmitted disappears, to be replaced by the universality with which a substitution or interpretation or instantiation produces an argument with a true conclusion when it has true premisses—against a background in which the universe is as it is, with no consideration of ways it might otherwise be. Equivalently, the impossibility of true premisses and an untrue conclusion disappears, to be replaced by the mere factual absence of a counterexample, where a counterexample is either a parallel argument with true premisses and an untrue conclusion or an interpretation on which the premisses are true and the conclusion untrue or an instance of a scheme of the argument that has true premisses and an untrue conclusion. The modal requirement in the truth-transmission conception that the argument can have true premisses and can have an untrue conclusion is replaced by the factual requirement that as a matter of fact at least one substitution or interpretation or instantiation produces an argument with true premisses and at least one produces an argument with an untrue conclusion.

Etchemendy (1990) objected to the replacement of modality by universality. He argued that the model-theoretic conception of logical consequence, which is generally accepted by contemporary logicians as the gold standard against which other conceptions are to be measured, is an incorrect precization of the modal conception, one that both under-generates and over-generates consequences, missing consequences that obtain and inventing consequences where there are none. Sher (1996) has replied that, because all the extra-logical constants in an argument's premisses and conclusion are subject to reinterpretation and variation of the domain is possible, the absence of a counter-interpretation is not just a matter of fact, but is a matter of logical necessity.

Sher's reply is however not open to defenders of the model-theoretic articulation of the truth-transmission conception of consequence, since on that conception not all the extra-logical constants in the premisses and conclusion of an argument need be subject to interpretation (or equivalently subject to re-interpretation if the extra-logical constants are already interpreted, as in arguments in a natural language). Consider for example the argument:

(4) Napoleon ruled France; Napoleon was exiled to Elba; so Napoleon was short.

Intuitively, the conclusion of this argument does not follow from its premisses: although Napoleon was in fact short, this fact does not follow from the biographical facts mentioned in the premisses. Yet the model-theoretic articulation of the truth-transmission conception implies that it does follow, since there is no re-interpretation

of the name 'Napoleon' on which the premisses are true and the conclusion untrue (because nobody other than Napoleon ruled France and was exiled to Elba, and Napoleon was in fact short), even though the "re-interpretation" of 'Napoleon' as the name of Napoleon produces an argument with true premisses and the re-interpretation of 'Napoleon' as the name of Giscard d'Estaing produces an argument with an untrue conclusion. The model-theoretic articulation of the truth-transmission conception of consequence thus over-generates consequences. Furthermore, the substitutional and schematic articulations fare no better, since no substitution for the word 'Napoleon' will produce an argument with true premisses and an untrue conclusion and no instance of the schema 'person *x* ruled France; person *x* was exiled to Elba; so person *x* was short' has true premisses and an untrue conclusion, even though in each articulation the non-triviality requirement is met. In a previous article (Hitchcock 1998, p. 32), I raised but did not answer the question how closely the model-theoretic, substitutional and schematic specifications of the truth-transmission conception of consequence fit our intuitive judgments of when a conclusion follows from stated premisses. The Napoleon argument in example (4) makes the answer clear. All three articulations are too loose a fit: they count conclusions as following when intuitively they do not follow. And the articulations are not on solid enough ground to over-rule our intuitive judgments about arguments like the Napoleon argument.

The crucial question for theoretical purposes is to figure out what is wrong with the Napoleon argument. Its premisses are impeccable: both true and known (independently of knowledge of the conclusion) to be true. Its conclusion is also true. There is also topical overlap, so the premisses cannot be stigmatized as lacking relevance in the sense in which relevance logicians make relevance a necessary condition for entailment. The premisses are evidently irrelevant to the conclusion in some broader sense that still needs theoretical articulation. It does not seem very illuminating, for example, to say that the premisses are not germane to the conclusion and have no bearing on it (Johnson and Blair 1993, p. 324) or that the truth of the premisses provides no basis for supposing that the conclusion is true, or indeed for supposing that it is false (p. 55). In the context of a conception of following as broader than following logically, we need to know in virtue of what feature of the Napoleon argument its premisses are non-germane to its conclusion, have no bearing on it, and provide no basis if they are true for supposing that the conclusion is true.

Unfortunately, the account of premissary relevance in (Hitchcock 1992) is not much help. According to that account, a premiss is irrelevant to a conclusion for which it is offered as support if it cannot ineliminably be put together with other at least potentially accurate information to provide a set of premisses that is sufficient to justify the conclusion (p. 260). But the premisses of the Napoleon argument can be put together ineliminably with the argument's associated material conditional to produce a formally valid argument. And the associated material conditional is not just potentially true; it is actually true and known to be true: a quick check of reputable sources will tell us that the associated material conditional has a true consequent (Napoleon *was* short), and hence is true. If the account of relevance in

(Hitchcock 1992) is to be rescued, we need some account of why this formally valid expanded argument with premisses known to be true is not sufficient to justify its conclusion. On reflection, the problem appears to be that the added premiss (the material conditional associated with the original Napoleon argument) cannot be known to be true independently of knowing that the conclusion is true, so that the argument cannot produce knowledge of the truth of its conclusion. In view of this problem, the account of relevance in (Hitchcock 1992) needs to be modified by requiring for relevance that one can discover that the other potentially accurate information is actually correct without assuming the truth of the argument's conclusion. On the modified account, then, a premiss is relevant to a conclusion for which it is offered as support if and only if there is a set of premisses that (a) when combined with the relevant premiss are sufficient to justify the conclusion, (b) are not jointly sufficient by themselves to justify the conclusion, (c) are at least potentially accurate, and (d) if accurate can be discovered to be accurate without assuming the truth of the conclusion.

The question is how to modify or replace the substitutional, model-theoretic and schematic articulations of the truth-transmission account of consequence so as to capture these partly epistemological constraints on relevance. On the surface, the Napoleon argument seems to meet the conditions under which a conclusion follows from given premisses. It has a covering generalization that is not only true, but known to be true: Every ruler of France who was exiled to Elba was short. Further, this covering generalization is non-trivially true: there is at least one ruler of France who was exiled to Elba (namely, Napoleon) and there is at least one person who was not short—for example, Giscard d'Estaing. But the non-trivial truth of this covering generalization does not license those who know of it to draw the conclusion from the premisses. Why not? One salient fact about the argument, already mentioned, is that, if you did not already know that Napoleon was short, the argument would give you no reason to believe that he was. This fact corresponds to the fact that our only basis for knowing that the argument's associated material conditional is true is that we already know that the conclusion is true. *A fortiori*, the only way to establish the truth of its generalization is to show for each instance where the antecedent is true that in this case the consequent is also true. One way to test this supposition is to consider a hypothetical case, e.g. another ruler of France who was not short, such as Jacques Chirac. If Chirac were exiled to Elba, he would not thereby become short. Nor is there any reason for restricting ex-rulers of France eligible for exile to Elba to those who were short. It seems then that a crucial requirement for a conclusion to follow from given premisses is that it has a covering generalization that is not only non-trivially true, but also can be known to be true independently of knowledge of truth of the conclusion. And it appears that we know that an argument has a true covering generalization independently of knowledge of the truth of the argument's conclusion if and only if we know that the covering generalization holds not just for actual cases that satisfy its antecedent but also for hypothetical cases that might satisfy it.

Consider another example:

(5) Abraham Lincoln was a president of the United States. So Abraham Lincoln was a man.

As a matter of fact, every previous president of the United States has been a man. But if we require an inference-licensing covering generalization to hold for hypothetical cases that might satisfy its antecedent, the fact that every previous president of the United States has been a man does not license us to infer from Abraham Lincoln's presidency that he was a man. For there is no rule against a woman being elected president of the United States. And indeed, counterfactually, if Walter Mondale had defeated Ronald Reagan in the 1984 US presidential election, and had then died in office, his running mate Geraldine Ferraro would not have become a man simply by succeeding him in the office of US president. The generalization that all previous US presidents have been men does not hold for all possible previous US presidents, even though it holds for the actual ones. This limitation corresponds, it seems, to the fact that the only way we can determine that every previous president of the United States has been a man is by discovering, directly or indirectly, about each of the previous[2] presidents that he was a man. The generalization cannot license an inference to the maleness of a particular previous president because our knowledge of its truth rests on already knowing that the particular previous president was a man.

It is tempting to identify the requirement that an argument's true covering generalization supports counterfactual instances with a requirement that the argument has a true law-like covering generalization. The covering generalization of the Socrates argument of example (3), that every human is mortal, is law-like if it is true. And such philosophers of science as Ernest Nagel have held (1961, pp. 71–72) that a singular counterfactual conditional holds if and only if the indicative form of its consequent follows logically from the indicative form if its antecedent in combination with a law and the requisite initial conditions for the law. The law would thus be a generalization of the indicative counterpart to the singular counterfactual conditional. But requiring a law-like covering generalization may be too demanding. Consider the argument:

(6) Obama lives in the White House, so he lives in Washington.

Intuitively, the conclusion of this argument follows from the premiss: from the fact that someone lives in the White House, we are entitled to conclude that this person lives in Washington. The reason, of course, is that the White House is located in Washington. However, neither this fact nor the generalization based on it is law-like. The White House, i.e. the residence of the president of the United States, could have been built somewhere else. Or the political boundaries might be different, with Washington and the District of Columbia divided up among the

[2] *Change in the present chapter*: The numeral '39' has been deleted before the word 'previous', in order to make the point generally applicable.

surrounding states, with each of them giving their portion of present-day Washington its own name. Nevertheless, given that at present the White House is in Washington, the generalization that whoever lives in the White House lives in Washington supports counterfactuals. If John McCain lived in the White House, he would live in Washington. If Vladimir Putin lived in the (US) White House, he would live in Washington. And so on. It should be noted in making these counterfactual judgments that the generalization is being taken to hold only for the present, conceived as a short indefinitely bounded stretch of time surrounding the time of its inscription; it could not license for example an inference from the claim that the 50th president of the United States will live in the White House to the conclusion that he or she will live at that time in Washington, DC, since either the location of the president's residence or the boundaries of Washington, DC might have changed between now and then in such a way as to falsify the generalization that whoever lives in the White House lives in Washington, DC. The time-boundedness of the covering generalization of the Obama argument immediately shows that it is not a natural law. Nevertheless, it supports counterfactual instances. Hence, since one could not know that counterfactual instances of a universal generalization were true if one could discover the truth of the generalization only by discovering the truth separately of each of its instances, the covering generalization of the Obama argument is known to be true independently of knowledge of the truth of the conclusion that Obama lives in Washington.

If one insists that any covering generalization that licenses an inference must be law-like, then one would be obliged to treat the Obama argument as having an unexpressed premiss, assumed to be mutually believed by both arguer and intended audience, that the White House is located in Washington, DC. With the addition of this premiss to the stated premiss, the conclusion would follow in virtue of the law-like generalization that whoever lives in a building that is located in a certain municipality lives in that municipality. But there seems to be no theoretical advantage to this approach over the approach of treating non-law-like covering generalizations that support counterfactual instances as licensing inferences, even if the license is temporally constrained. And, practically speaking, it is easier to ask directly whether an argument has a true covering generalization that supports counterfactual instances than to ask whether it can be supplemented with additional correct information in such a way that the expanded argument has a true law-like covering generalization. With this latter approach, for example, one must make sure that the conclusion does not follow from the additional correct information independently of the argument's stated premisses. Further, treating the conclusion of the Obama argument in example 6 as following just from the stated premiss corresponds better to the phenomenological fact that one would not use any other premiss than the stated premiss in reasoning for oneself from it to the stated conclusion.

8.4 Second Reformulation: Following as Counterfactual-Supporting Truth-Transmission

Thus it appears that, in the case of non-logical consequence, we cannot capture the consequence relation through a merely universal condition, whether expressed substitutionally, model-theoretically or schematically. But, contrary to the position adopted in (Hitchcock 2009), the non-logical consequence relation need not hold as a matter of nomic necessity. It is enough if the universal condition holds counterfactually, of any individual supposed to satisfy its antecedent. Necessarily true universal covering generalizations do hold counterfactually, and as we have seen the necessity of the generalization need not be semantic but might be for example physiological or constitutional. But, as the Obama argument of example (6) shows, some universal covering generalizations hold counterfactually even if they are not nomically necessary.

Substitutional and model-theoretic articulations of the consequence relation cannot be modified to express the requirement that a universal condition holds counterfactually. But schematic articulations can. We can revise the schematic articulation of the truth-transmission conception of consequence to read as follows: A conclusion is a consequence of given premisses if and only if the argument is an instance of an argument scheme, which may or may not be purely formal, that has no actual or counterfactual instances with true premisses and an untrue conclusion, even though it has an instance with true premisses and an instance with an untrue conclusion.

The counterfactual-supporting version of the schematic articulation of the truth-transmission conception of consequence automatically addresses a limitation of standard substitutional and schematic articulations—namely, the limitation that an argument may lack a counterexample because of the limitations of the language in which it is expressed. In opening up a space for instances that are hypothetical rather than actual, we allow that the language may have no name for such merely hypothetical instances. We can accommodate such presently nameless possible instances by allowing the addition of new names to the language in which the argument is expressed.

Counterfactual-supporting truth-transmission in virtue of an argument scheme depends on the truth of a covering generalization of the argument that will support counterfactual instances. The generalization might be physically contingent, like the generalization that whoever lives in the White House lives in Washington. But it must support counterfactual instances. A true contingent generalization that does not support counterfactuals will not license an inference from its antecedent to its consequent. Thus the fact that every president of the United States has been a man does not license an inference from Abraham Lincoln's having been president of the United States to his having been a man, for the generalization about the sex of American presidents has false counterfactual instances: if Walter Mondale had been elected U.S. president in 1984 and had died in office, to be succeeded by his running mate Geraldine Ferraro, she would not have been a man.

It would make things theoretically neat if in general knowledge of the truth of true universal generalizations that do not support counterfactual instances had to rest ultimately on knowledge of the actual instances that fall under them. But consider the universal generalization that all spheres of gold are less than one mile in diameter, contrasted to the law-like generalization that all spheres of uranium are less than one mile in diameter (Carroll 2011). Here our belief in the universal generalization does not rest on knowledge of the diameter of all the actual spheres of gold, past, present and future, but on knowledge of facts about the cost, scarcity and uselessness (for all but ornamental and fetishistic purposes) of gold. Thus an argument like:

(7) This sphere is pure gold, so its diameter is less than a mile.

though its conclusion does not follow just from its stated premiss, could be rescued by attributing to it an unexpressed premiss that every sphere of gold has a diameter less than a mile.

The requirement that a generalization licensing an inference support counterfactual instances implies an asymmetry in the treatment of real-life arguments. If someone were to argue that Abraham Lincoln was a man, because he was president of the United States, one could as far as I can see get the conclusion to follow from the premiss only by attributing to the argument an unstated premiss that all previous presidents of the United States were men. But, in contrast to the gold argument in example (7), this manoeuvre would not make the argument respectable, since any epistemic justification for the added premiss would have to appeal ultimately to the information in the conclusion.

The theoretical asymmetry in the treatment of formally invalid arguments is however not as extensive as one might imagine. Occasionally people advance arguments whose conclusion follows, if at all, in virtue of a merely contingent generalization. But, rather surprisingly, it seems that these merely contingent generalizations support counterfactuals. Consider the following remarks by a caller to a radio phone-in show soon after the invasion of Iraq in March 2003, at a time when there were reports of Iraqi families being told they will be murdered if they don't fight:

(8) I think you will make a very poor soldier if you put a gun on his head or on his family and say, "Go and fight". We have to acknowledge that the Iraqis are fighting an aggression whether rightly or wrongly. They think that they are going to be occupied. And even the US army generals are acknowledging that they are having a stiff resistance. You do not get stiff resistance from soldiers who are under duress. (Hitchcock 2010a, p. 41)

The context makes clear that the caller is arguing that the Iraqi soldiers are not fighting under duress, a conclusion that follows almost logically from his last two statements. The preceding statements appear to give two additional independent arguments for the same conclusion. If we take the first statement as the premiss of one of those arguments, and supply the implicit conclusion, we get the following argument:

(9) …you will make a very poor soldier if you put a gun on his head or on his family and say, "Go and fight"; so the Iraqi soldiers are not fighting under duress.

If we acknowledge the semantic connection between fighting under duress and being told to go and fight with a gun on one's head or on one's family, we can see that this argument is an instance of the schema 'People who are *F* are very poor soldiers, so the Iraqi soldiers are not *F*'. The universally generalized material conditional associated with this schema turns out to be logically equivalent to the statement that the Iraqi soldiers are not very poor soldiers; for the proof, see the Appendix. This statement is what a skilled argument analyst would intuitively attribute to the caller as an assumption involved in using his general point about very poor soldiers to support a claim about the Iraqi soldiers in particular. But, even though the covering generalization is not law-like, it does support counterfactuals. If the Iraqi soldiers are not very poor soldiers, then, if short people were very poor soldiers, then the Iraqi soldiers would not be short. And so on.

Thus, contrary to the approach recommended in (Freeman 2011a, pp. 186–189), the fact that an argument lacks a true nomically necessary covering generalization does not require adoption of the unexpressed premiss approach in order to understand and then evaluate the argument. A true nomically contingent covering generalization will license the inference in the stated argument if it supports counterfactual instances. Even singular contingent statements can license inferences, as in the Iraqi soldiers argument of example (9). In particular, there is no need to revert to an unexpressed premiss in order to understand and evaluate the following artificial argument discussed by Freeman (2011a, p. 183):

(10) All humans are mortal, so Socrates is mortal.

The argument is an instance of the schema: All humans are *F*, so Socrates is *F*. The corresponding universal covering generalization is that Socrates has every property that all humans have. By parallel reasoning to that used for the Iraqi soldiers argument of example (9), this generalization is logically equivalent to the contingent singular statement that Socrates is human. Assuming that this statement is true, it will license the inference in the Socrates argument of example (10), provided that the universal generalization to which it is logically equivalent supports counterfactual instances. And in this case it does. If all humans had green skin, Socrates would have green skin. If all humans had blue eyes, Socrates would have blue eyes. And so on. (The Socrates argument of example (10) is of course artificial; it is hard to imagine someone putting it forward seriously in an attempt to establish its conclusion. But one can readily imagine a parallel argument with the name 'Jesus of Nazareth' replacing 'Socrates' being seriously advanced by a critic of a certain position in Christian theology.)

As far as I can see, people do not reason and argue in accordance with argument schemes whose corresponding universal generalization does not support counterfactual instances. To put the point another way, for all but one of the arguments I have collected in two rounds of random sampling of arguments (Hitchcock 2002, 2010a), resulting in more than 100 inferences for evaluation, I have been able to

construct a covering generalization that, if true or otherwise acceptable, would apparently hold for counterfactual instances. To bolster this claim, it would be necessary to get independent and unbiased judgments from at least two people as to whether a given universal generalization if true would support counterfactual instances. Such judgments may require real-world knowledge, as in the case of a sphere of gold versus a sphere of uranium. But, despite ongoing disputes about the truth conditions for counterfactual singular conditionals (Lewis 1973; Pearl 2009; Arregui 2009), there seems little disagreement about the truth value of counterfactual instances of a true universal generalization in a world otherwise much like ours or with the same invariant causal relationships as ours. For example, the reader should readily agree that Jacques Chirac would not be short if he not only was a former ruler of France but also had been exiled to Elba; that Socrates would have had green skin if all humans had green skin; that a sphere of gold would not have a diameter less than a mile if it had a circumference of four miles; and so on for the other examples in this chapter.

8.5 Elaboration and Extensions of Counterfactual-Supporting Truth-Transmission

On the counterfactual-supporting truth-transmission account, then, a conclusion follows from given premisses if and only if the argument is an instance of an argument scheme, which may or may not be purely formal, that has no actual or possible instances with true premisses and an untrue conclusion, even though it has an instance with true premisses and an instance with an untrue conclusion.

This account, it turns out, needs elaboration and extension, in four respects.

8.5.1 Restrictions on the Range of the Variables in an Argument's Schema

First, in testing to see whether an argument has a counterfactual-supporting covering generalization that is non-trivially true, we may need to restrict the range of the variables in a generalization under consideration. Such restrictions are implicit in the examples of covering generalizations already given, where the range of variables is restricted to persons, countries, places and so on. To take another example: if someone argues that marijuana should be legalized on the dual ground that it is less harmful than alcohol and that alcohol is justifiably legal, it is reasonable to restrict the variables in the covering generalization to psychotropic drugs (Hitchcock 1985). Such restrictions presuppose the background information that the name or other term over which one generalizes falls within the specified range: Napoleon is a person, France is a country, marijuana and alcohol are psychotropic

drugs, and so forth. Background information of this sort can be treated as an unstated premiss if one wishes, or more accurately as an unstated presupposition: in a debate about legalizing marijuana, one does not need to state that marijuana is a mind-altering drug.

8.5.2 *Generalization from Truth to Acceptability*

Second, some may balk at assigning truth-values to deontic generalizations. To accommodate such sensitivities, we can replace the word 'true' in the articulation of the truth-transmission conception of consequence with a word like 'acceptable' or 'justifiable' (in their normative senses), treating truth as a property that confers acceptability or justifiability in the intended sense.

8.5.3 *Allowance for Conclusions that Are not Assertives*

Third, allowance needs to be made for conclusions that are not assertives. One can argue for any of the kinds of speech acts distinguished by Searle (1979), including commissives, directives, expressives, declaratives and suppositives (Hitchcock 2006). For example, the following exchange on a radio phone-in show about the epidemic of Sudden Acute Respiratory Syndrome (SARS)[3] in Toronto in the spring of 2003 concludes with an argument for a question:

> (11) Caller (Gina from Toronto): —Hi. I wanted to speak about the SARS.
>
> Roy (program host): —Yes. Go ahead, please.
>
> Gina: —OK. On the weekend they had… were looking for court orders for two people who had not obeyed the quarantine. They now have a student who cut short her quarantine after ten days to write an exam. She's now ill, and they have now 25 students and a teacher, I believe. So, considering how the government mishandled Walkerton[4] and the East Nile virus, where… it's worked out OK with SARS, I realize they're not saying an epidemic, but last week before they really, really knew and the TTC [Toronto Transit Commission–DH] driver wanted to wear a mask, where was their union? They said their hands were tied, that they can't do anything when the Board of Health says this, but why do people so blindly believe government officials?

[3]SARS was a new, highly contagious respiratory viral infection that turned out to have a fatality rate of about 15%. Public health authorities reacted by imposing a quarantine on anybody suspected of being at risk for contracting the disease. The disease was eventually eradicated as the result of an aggressive world-wide campaign to stamp it out.

[4]Walkerton is a small town in Ontario whose water supply became contaminated in May 2000. Almost half the population became ill, and seven people died. A study put the cost of dealing with the tragedy at $64.5 million. (http://www.cbc.ca/news/background/walkerton/; accessed 2011 03 14).

> Roy: —Well, you know, I think when it comes to an issue like SARS, you do look to official explanations and official sources…
>
> Gina: —Yes. Just like Walkerton and the East Nile virus, which they mishandled
>
> Roy: —West Nile.
>
> Gina: —West Nile virus,[5] I'm sorry. Which they mishandled. So why do you want to believe them now? (Hitchcock 2010a, p. 55)

Gina's concluding sub-argument, supporting her question, "Why do people so blindly believe government officials?", runs as follows:

> (12) Premiss: The government mishandled Walkerton and the West Nile virus.
>
> Intermediate conclusion: Why do people so blindly believe government officials <on this public health crisis–DH>?

We can construct a covering generalization in the usual way, recognizing the shared background information that Walkerton and the West Nile virus were public health crises: If a government mishandled two previous public health crises, why do people so blindly believe what officials of the government say on another public health crisis? In evaluating whether this covering generalization is acceptable, we need to judge the force of the 'why' question. Taken literally, it is a request for an explanation of people's blind belief in the statements of government officials. What motivates such a request is the presupposition that such blind belief makes no sense. The acceptability of the question is thus a function of the *prima facie* foolishness of blindly believing statements about a public health crisis by officials of a government that recently mishandled other public health crises.

As with this example, one can develop criteria for the acceptability of speech acts of all types, criteria that can be used in judging whether a commissive or directive or expressive or declarative follows from the reasons given in its support.

8.5.4 Allowance for Rebuttable Inferences

Fourth, allowance needs to be made for rebuttable inferences, where the conclusion does not follow definitely from the premisses but is merely made probable or possible or presumptively acceptable by them. Such inferences are rebuttable in the sense that further information compatible with the premisses can make the conclusion false or otherwise unacceptable. A conclusion that follows definitely from the premisses, on the other hand, is not rebuttable in this sense; if it is unacceptable, there must be something wrong with at least one premiss. It is however

[5]In the summer of 2002, 19 people in the southern part of Oakville, Ontario were hospitalized for diseases caused by the West Nile virus, which is transmitted to humans by mosquito bites. (http://www.health.gov.on.ca/english/public/pub/ministry_reports/wnv_rep_2003/wnv_rep03.html; accessed 2011 03 14).

underminable, given the non-triviality requirement for transmission of acceptability. The information that Arthur is either a farmer or a grocer but is not a farmer necessitates as a consequence that Arthur is a grocer, but additional information that Arthur is a farmer undermines the inference. It does not follow necessarily from the premiss set {Arthur is a farmer, Arthur is not a farmer, Arthur is either a farmer or a grocer} that Arthur is a grocer.

To signal a rebuttable inference, arguers sometimes use modal auxiliaries or adverbs, as in the following argument from a caller to a phone-in radio show:

> (13) … when someone is purchasing a puppy, many times they are going to a breeder that's just in it for profit, so the puppy's already starting out with maybe not a good head start. (Hitchcock 2010a, p. 18)

The caller acknowledges that not every puppy bought from a breeder just in it for profit lacks a good head start. The qualifier 'maybe' reduces the strength of the inference claim, which thus needs for its support only a counterfactual-supporting existential generalization that some animals bought from breeders just in it for profit do not get a good start.

With these four complications, the truth-transmission account, which should now be called an acceptability-transmission account, appears capable of handling all inferences. We can sum it up as follows. A conclusion follows from given premisses if and only if an acceptable counterfactual-supporting generalization rules out, either definitively or with some modal qualification, simultaneous acceptability of the premisses and non-acceptability of the conclusion, even though it does not rule out acceptability of the premisses and does not require acceptability of the conclusion independently of the premisses. (The account is framed in terms of the non-acceptability of the conclusion rather than its unacceptability, to allow for the possibility that a conclusion is neither acceptable nor unacceptable, because it is neither worthy of acceptance nor worthy of rejection.) An inference claim is thus the claim that a counterfactual-supporting covering generalization is non-trivially acceptable.

This consequence relation has structural properties that deserve investigation. For example, it is transitive only under certain conditions, and obeys the cut rule only under certain conditions. Hence it implies restrictions on the chaining of arguments together to support a final conclusion by means of one or more intermediate conclusions drawn along the way. The present paper prescinds from investigation of these restrictions, because of limitations of space and time. In a recent investigation of rebuttable inference, Verheij (2010) shows that a non-monotonic consequence relation in "reason-based argumentation" has seven properties, which he calls logical equivalence, restricted reflexivity, antecedence, right weakening, conjunctive cautious monotony, mutual attack and conjunctive cumulative transitivity. It needs to be investigated which of these properties belong to consequence conceived as acceptability-transmission licensed by a non-trivially acceptable counterfactual-supporting covering generalization.

If one insists that a conclusion follows from given premisses only if it follows formally from them, then one can treat the inference claim of an argument that is not formally valid as the claim that the argument has as an unstated premiss a counterfactual-supporting covering generalization that is non-trivially acceptable. Hence, if one thinks that formally invalid arguments have a gap between premisses and conclusion that needs to be filled by a gap-filling implicit assumption (Ennis 1982), then one will supply as the gap-filler the most non-trivially plausible counterfactual-supporting covering generalization of the stated argument.

8.6 A Sceptical Rejoinder

Sceptics can counter that this account of inference claims is unnecessarily complicated, that the inference claim of an argument is just its so-called "associated conditional" (Hitchcock 1985), i.e. the singular conditional whose antecedent is the conjunction of the premisses and whose consequent is the conclusion. Doesn't the connective 'if' simply mean that the consequent follows from the antecedent, as Stoic logicians long ago maintained (Diogenes Laertius 7.71 [Diogenes Laertius 2005])? And don't theorists of argument reconstruction object that supplying an argument's associated conditional as its unstated gap-filling premiss is merely reiterative, not really informing us of the substantive assumption used or needed to infer the conclusion?

Let us grant that in at least one of its uses a singular indicative conditional sentence means that its consequent follows from the antecedent. In fact, in the ancient dispute about the truth-conditions for singular indicative conditionals, it was common ground that a conditional is true when its consequent follows from its antecedent (Sextus Empiricus 2.112 [Sextus Empiricus 1997]; cf. Barnes 2007, pp. 125–126). The dispute was about what it took for this condition of following to be met. The earliest proposal was that of the logician Diodorus Cronus, who proposed that a true conditional was one that neither could nor can begin from a truth and end in a falsity (Sextus Empiricus 2.115). This modal conception would imply that a conclusion follows from given premisses if and only if it was and is impossible for the premisses to be true and the conclusion false. The present conception of the consequence relation is similar, with the additional requirement that the impossibility be non-trivial (i.e. not due to the impossibility that the premisses are true and not due to the impossibility that the conclusion is false), the clarification that the impossibility need not be logical or semantic (and indeed can be established by any counterfactual-supporting covering generalization), allowance for the ruling out of true premisses and a false conclusion to hold only for a specious present rather than omni-temporally, the expansion of the property of truth to other kinds of acceptability, and the recognition of modally qualified rebuttable consequences. I propose then, following the ancient tradition, to take the present account of the consequence relation to be also an account of the truth conditions of

a singular indicative conditional, in at least one of its senses. In this sense, a singular indicative conditional is definitively acceptable if and only if it has a counterfactual-supporting generalization that is non-trivially acceptable. It is acceptable in some qualified way if and only if it has a counterfactual-supporting generalization that is non-trivially acceptable in the same qualified way.

Of course, some philosophers of language, starting with Diodorus' own pupil Philo of Megara (Sextus Empiricus 2.113–114) and continuing as recently as in the work of Paul Grice (1989, pp. 58–85), maintain that the singular indicative conditional is true if and only if it does not have a true antecedent and a false consequent. But, although Philo thought that the consequent of a conditional with such truth conditions follows from its antecedent, contemporary logicians and philosophers of language generally reject this claim. They take the medieval conception of a *consequentia materialis* as a consequence that holds unless the premisses are true and the conclusion false (Kneale and Kneale 1962, pp. 274–297) to reflect confusion between the truth of a conditional and the validity of an argument from its antecedent to its consequent. Likewise, they regard as unfortunate the use by Whitehead and Russell in *Principia Mathematica* (1910–1913) of the phrase 'material implication' for the Philonian truth-functional conditional, since they generally follow Lewis (1912) in regarding the truth-functional conditional as not capturing the sense in standard English of the word 'implies', which signifies the converse of the relation of following. The problem with construing the Philonian conditional as expressing the implication of its consequent by its antecedent, it is generally thought, is the so-called "paradoxes of material implication": a falsehood would imply anything and anything would imply a truth.

8.7 Anti-generalist Alternatives

Some contemporary theorists of argumentation have, however, defended the view that the inference claim of an argument is its associated singular conditional, taken by some of them to be truth-functional (i.e. Philonian or "material") and by others to be *sui generis*. Others have argued, within the unexpressed premiss approach, that either always or sometimes the unexpressed premiss of an argument that is not formally valid is just the argument's associated singular conditional, whether truth-functional or *sui generis*. I shall consider each of the four views.

8.7.1 Bermejo-Luque

Bermejo-Luque (2006, 2011a) interprets the inference claim made in the complex speech act of arguing as the claim that the argument's associated material conditional is true. Her interpretation seems incorrect on its face, for the mere absence of

the circumstance that the argument's reasons are true and its conclusion untrue seems weaker than the circumstance that the conclusion follows from those reasons. Suppose, for example, that someone were to argue:

(14) 8 is divisible by 2, so 8 is divisible by 4.

This is clearly a bad argument, even though it has a true premiss and a true conclusion. You cannot legitimately infer from the fact that 8 is divisible by 2 that 8 is also divisible by 4, even though as a matter of fact it is true that 8 is divisible by 4. Thus the inference claim in the divisibility argument of example (14) is false. But the associated material conditional is true, because it has a true consequent.

In this counterexample, the conclusion is known to be true independently of the argument put forward in its support. Bermejo-Luque tries to ward off this sort of counterexample by remarking that an argument's associated material conditional

> is to be valued under the argumentative conditions in which it arises, namely, that the reason alleged in the argument (whose content is the antecedent of the conditional) is supposed to be true or highly acceptable, and also that we have not already independently determined the real value of the claim for which we argue (whose content is the consequent of the conditional). These conditions suffice to free us from the paradoxes of material implication… (Bermejo-Luque 2006, p. 79; cf. her 2011a, p. 79)

So we are to construe the supposed counterexample as an argument presented in a situation where it is supposed to be true that 8 is divisible by 2, but we have not already determined independently whether 8 is divisible by 4. To make such a situation plausible, let's vary the example slightly to one where the arithmetical premiss has been determined to be true, the arithmetical conclusion not yet determined to be true, and the inference is apparently incorrect. An example might be the following argument:

(15) 79,974 is divisible by 3, so 79,974 is divisible by 9.

According to Bermejo-Luque, the fact that the premiss of this argument is supposed to be true (and can in fact easily be checked to be true) but that we have not yet determined whether the conclusion is true (because we have not yet tried to divide 79,974 by 9) frees us from the paradoxes of material implication when we come to appraise the argument's associated material conditional. To avoid confusion with other senses of the conditional, let us consider the situation in terms of the logically equivalent negajunction 'Not both 79,974 is divisible by 3 and 79,974 is not divisible by 9.' Given that we know that the first of the two conjuncts in this negated conjunction is true, the easiest and most direct way to determine whether the negajunction is true is to check whether the second conjunct is also true. If the second conjunct is also true, then the whole conjunction is true, the associated negajunction is false and the conclusion (on Bermejo-Luque's account) does not follow. If the second conjunct is false, then the whole conjunction is false, the associated negajunction is true and the conclusion (on Bermejo-Luque's account) does follow. The fact that we have not already determined the value of our

conclusion does not bar us, when it comes to appraising the argument's associated material conditional, from making such a determination independently of the argument offered in its support. If we have a way of making such an independent determination, and that determination yields the result that the conclusion is true, we will rightly conclude that the associated negajunction is true. Thus, on Bermejo-Luque's account, every act of arguing for a conclusion whose propositional content can be determined to be true independently of the propositional content of its premisses makes a true inference-claim: its conclusion does in fact follow from the premisses offered in its support.

This is a clearly unacceptable consequence, as we can readily see by constructing simple examples of arguments with an obviously true conclusion and an obviously irrelevant premiss. Consider:

(16) Snow is white, so grass is green.

This is not a good argument, even though both its premiss and its associated negajunction are both known to be true. The conclusion that grass is green simply does not follow from the premiss that snow is white, which is obviously totally irrelevant to the conclusion. The word 'so' when used inferentially implies, as part of its meaning and not as some pragmatic implicature of its ordinary use, that the statement preceding it is relevant to the statement following it, in the sense explicated in (Hitchcock 1992) and qualified earlier in the present chapter, that it helps to establish the truth of the conclusion. The truth of an argument's associated negajunction is not sufficient to secure such relevance.

In a symposium on Bermejo-Luque's *Giving Reasons*, Freeman (2011b) and Pinto (2011) raise similar objections to Bermejo-Luque's identification of the propositional content of an arguer's inference claim with the argument's associated material conditional. In reply, Bermejo-Luque reiterates and elaborates her position as follows:

> … following Grice's account of conditionals, I take inference-claims of the form "if 79974 is divisible by 3, then 79974 is divisible by 9" to be conversationally inappropriate, but not false. In other words, I think that an act of arguing such as "79974 is divisible by 3, therefore 79974 is divisible by 9" is semantically correct, but pragmatically flawed because the reason is irrelevant. To my mind, this kind of irrelevance is pragmatic: we put forward a reason in order to show a target claim to be correct, but the reason does not work for this end. On Grice's account, the only circumstances in which it is appropriate to assert a conditional is where the speaker is ignorant of the truth values of R [the reason—DH] and C [the conclusion—DH], but believes that if R happens to be true, C will as well. (Bermejo-Luque 2011b, pp. 229–230)

This restatement helps to defuse the obvious objection to Bermejo-Luque's interpretation of an arguer's inference-claim as the claim that the argument's associated material conditional is correct. On her account, a good act of arguing requires not just that the arguer's inference-claim be true but that the arguer be in a position to assert it. That is, the arguer must have a basis for asserting it other than the denial of

the reason or the assertion of the conclusion. Bermejo-Luque herself acknowledges that this basis can include (2011a, p. 65), and indeed will consist in (p. 198), general rules or general facts from which the material conditional follows. Thus in the end her position is not far from that of the present chapter, except that she rests the claim that an argument has a covering generalization on the pragmatics of advancing it rather than on the semantics of inferential particles and phrases. Later in this chapter, in the discussion in Sect. 8.7.3 of Janne Maaike Gerlofs' position, I will return to the question whether justification of a material conditional without using a paradox of material implication requires appeal to some generalization of it.

8.7.2 Verheij

Verheij (2006, p. 186) also identifies the inference-claim of an argument with its singular, ungeneralized associated conditional. Verheij takes an argument to express that its premisses collectively support its conclusion, and takes this support relation to be expressed by the conditional sentence 'if <the premisses> , then <the conclusion>'. For example, in the following argument:

(17) Harry was born in Bermuda, so Harry is a British subject.

the claim that the premiss 'Harry was born in Bermuda' supports the conclusion 'Harry is a British subject' is expressed by the sentence:

(18) If Harry was born in Bermuda, he is a British subject.

Unlike Bermejo-Luque, however, Verheij refuses to identify an argument's inference claim with the material conditional, because the material conditional is truth-functional:

> …a material conditional is truth-functional: its truth value is determined by the truth values of the conditional's antecedent and consequent… The conditional 'If D [data—DH], then C [conclusion—DH]' implied by an argument 'D. So C' should however intuitively reflect some relation between D and C that is not captured by the truth values of D and C alone. (Verheij 2006, p. 187)

Let us call Verheij's non-material, non-truth-functional singular conditional an '*inferential conditional*', since it expresses the condition that an argument's premisses support its conclusion, i.e. that it is legitimate to infer the conclusion from the premisses. Verheij does not give a complete account of the semantics of the inferential conditional. He tells us that it validates *modus ponendo ponens*; in other words, an argument from an inferential conditional and its antecedent to the consequent of the inferential conditional is formally valid. He tells us that one cannot derive an inferential conditional on the basis of logic alone (e.g. from a deduction of

its consequent from its antecedent), but must always base its derivation on premisses. But he says very little about what premisses would entitle us to infer the truth of an inferential conditional. In fact, he claims that, if the logic of the inferential conditional were expressed in a natural deduction system, it would have the standard elimination rule for conditionals, namely *modus ponendo ponens*, but would have no introduction rule. The only derivation of an inferential conditional that he recognizes as legitimate is its derivation using *modus ponendo ponens* from a more complex inferential conditional of which the inferential conditional is the consequent. In particular, the inferential conditional associated with a particular argument follows from what he calls [following Toulmin (1958)] the argument's warrant, which is a conditional scheme expressed in ordinary language as a rule statement. For example, the inferential conditional (18) that Harry is a British subject if he was born in Bermuda follows from the following statement:

(19) A person born in Bermuda is a British subject.

The inferential conditional expressing that this statement (19) supports the original argument's associated inferential conditional (18) is the following statement:

(20) If a person born in Bermuda is a British subject, then Harry is a British subject if he was born in Bermuda.

The consequent of this second-order inferential conditional is according to Verheij an instance of its antecedent.

Verheij needs to complete his account of the semantics of the inferential conditional. In particular, since a rule statement like "a person born in Bermuda is a British subject" sounds awfully like a generalized material conditional, and the inferential conditional associated with an argument is supposed to be an instance of such a rule statement but not to be a mere material conditional, Verheij needs to tell us how a warrant differs from a generalized material conditional. The answer, I suspect, will be an account like the one I have been developing in this paper, that it must be a counterfactual-supporting generalization of the argument's associated material conditional. In that case, Verheij's singular inferential conditional will have just the meaning that I am attributing to singular indicative conditionals when they signify that their consequent follows from their antecedent.

8.7.3 Gerlofs

Janne Maaike Gerlofs works within the mainstream logical tradition according to which an argument that is not explicitly formally valid is to be reconstructed by supplying an unexpressed premiss whose addition will make the argument formally valid. She argues (2009, 2011) that in general the argument analyst should supply

as the unexpressed "connecting" premiss the argument's ungeneralized associated material conditional.[6]

In defence of her position, Gerlofs points out that the associated material conditional does do the job of transferring acceptability from the expressed premiss to the conclusion, by means of the valid form of argument *modus ponendo ponens*. Given this role, she argues, the associated material conditional is what Davies (1979) calls a "knowledge conditional", defined as a conditional in which the antecedent contains accepted knowledge and the consequent a conclusion "deduced" (i.e. inferred) from this knowledge: in argumentation the antecedent is put forward as already accepted and the connecting premiss (whether expressed or unexpressed) is put forward as a means of transferring acceptability from the non-connecting premiss to the conclusion. Further, material conditionals derived using the paradoxes of material implication cannot be used as a connecting premiss. If the author of an argument defends its connecting premiss by appealing to the truth of its consequent, the reasoning is circular if the premiss is being used to transfer acceptability from its antecedent to its consequent and involves a contradiction if the connecting premiss is a counterfactual conditional being used to transfer unacceptability from its consequent to its antecedent (Gerlofs 2009, p. 107). Similarly, if the author defends the connecting premiss by appealing to the falsehood of its antecedent, the reasoning is circular if the premiss is being used to transfer unacceptability from its consequent to its antecedent and involves a contradiction if it is being used to transfer acceptability from its antecedent to its consequent. Thus the paradoxes of material implication are deprived of their sting.

An argument's associated material conditional is the logical minimum among the statements that can be added to make an argument formally valid, in the sense

[6]In her (2009), she makes an exception for cases where what she calls the "connecting premise" is explicit. If the stated premiss is a singular indicative conditional and the conclusion is the consequent of that conditional, one needs to supply its antecedent as the unexpressed premiss; an example is the argument, "There is no reason to inform the Child Protection Office. If there is no evidence the father started the fire deliberately to hurt his children, there is no need to do so", where one should supply as the unexpressed premiss, "There is no evidence the father started the fire deliberately to hurt his children" (p. 86). If the stated premiss is a counterfactual conditional offered in support of the denial of its antecedent, one needs to supply the denial of its consequent as the unexpressed premiss; an example is the argument, "Daniel is no athlete. If Daniel were an athlete, he would have stamina", where one should supply as the unexpressed premiss, "Daniel does not have stamina." (p. 103).

Added in the present republication: One can get covering generalizations for these arguments by generalizing over a repeated constituent sentence, in the first case the sentence 'there is no reason to inform the Child Protection Office', in the second case the sentence 'Daniel is an athlete'. The resulting generalizations are logically equivalent to the premiss that Gerlofs provides. If the premiss that Gerlofs provides is true, then the covering generalization to which it is logically equivalent cannot have an instance with a false antecedent, since the antecedent of any instance will be in the first argument a material conditional with a true consequent and in the second argument a material conditional with a false antecedent. Thus, each argument would have a true covering generalization that supports counterfactual instances, in the sense that, trivially, every instance of it with a false antecedent is true.

that it follows logically from any statement whose addition as a premiss will make the argument formally valid without making a stated premiss redundant. In her (2011), Gerlofs argues that treating the connecting premiss of an argument as this logical minimum has heuristic advantages, in that it enables one to classify critical questions that one can raise about an argument and to determine whether critical questions posed for a given argumentation scheme cover all the points where a particular argument fitting the scheme can be questioned. She points out that the critical reactions to an argument, which correspond to the critical questions belonging to its argument scheme, can concern the acceptability of the argument's premisses, the ground for the logical minimum or the connection between the ground and the logical minimum.

Gerlofs' proposal is carefully articulated and defended, and deserves serious consideration. My suspicion is that, if one investigates the ways in which a singular material conditional can be defended, other than by denying its antecedent or affirming its consequent, one will discover that one needs to appeal to a counterfactual-supporting covering generalization, or to something logically stronger that implies a counterfactual-supporting covering generalization. If so, then, given the pragmatic constraints that Gerlofs imposes on the justification of an unexpressed connecting premiss, her position would turn out to be equivalent to mine: the argument as stated implies that it has a counterfactual-supporting covering generalization that is non-trivially acceptable.

Gerlofs herself proposes (2009, pp. 111–117) to evaluate connecting premisses by means of argument schemes, whose expression as a generalized conditional would provide what she calls the "ground" for the connecting premiss. Such schemes are in fact generalizations, at some level of abstraction, of the particular argument taken to fit them, and are taken to hold counterfactually and non-trivially, given satisfactory answers to the "critical questions" associated with them that pertain to the transfer of acceptability from premiss to conclusion (Hitchcock 2010b). Thus her position turns out to be equivalent to mine. But her only argument for restricting the justification of connecting premisses to an appeal to argument schemes is that an arguer cannot justify a connecting premiss by appealing directly to the truth values of its antecedent and consequent.

How can one justify a singular material conditional, other than by denying its antecedent or affirming its consequent? The typical strategy for proving a conditional is to assume its antecedent and derive its consequent. One can then discharge the assumption and assert the conditional on the basis of the assumptions other than the antecedent that were used in deriving the consequent from the antecedent. In a situation where we are given an argument from the antecedent to the consequent and are treating the material conditional as the logically minimal gap-filler, the assumptions enabling us to derive the consequent from the antecedent would serve as what the pragma-dialectical approach calls the "pragmatic optimum" (van Eemeren and Grootendorst 1992, pp. 63–64). In general, an argument for some conclusion would transfer acceptability from the stated premisses to the conclusion if and only if the associated singular material conditional follows from acceptable assumptions none of which either are identical to or rely for their support on the

conclusion. Thus, the inference claim of any argument is the claim that its associated singular material conditional follows from acceptable assumptions that are epistemically independent of the conclusion. It is clear that a generalization of the associated conditional that supports counterfactuals must be based on more than the truth of the consequent or the falsehood of the antecedent. What is not clear is that any assumptions epistemically independent of the conclusion that are sufficient for it to follow logically from the stated premisses must be at least as strong as some counterfactual-supporting generalization. However, two suggestions of epistemically independent assumptions other than a counterfactual-supporting generalization turn out to entail a counterfactual-supporting covering generalization. Bermejo-Luque suggested (personal correspondence) that a reason for "if you promised, you have to do it" (construed as a material conditional, i.e. a negajunction) may be something like the very definition of "promising". She also suggested that a reason for "if the litmus paper turned red, then the liquid in which it was dipped is an acid" may be something like a chemical explanation. Definitions and chemical explanations, however, although they are not covering generalizations, entail covering generalizations, which support counterfactual instances if the definition or chemical explanation is correct. So reasons of this kind imply that the author of the argument is committed to a covering generalization of its associated negajunction. These two attempts thus failed to find a way of deriving a conclusion from premisses that is epistemically independent of the truth of the conclusion but does not entail a counterfactual-supporting covering generalization. Their failure, however, at best justifies a presumption that the approach of Gerlofs and the similar approach of Bermejo-Luque are de facto equivalent to the position of the present chapter.

8.7.4 Ennis

The present account of inference claims implies that all inference is general. If a conclusion follows from given premisses, then a parallel conclusion follows also from relevantly parallel premisses, even ones that are purely hypothetical. The generality of all inference undergirds the strategy sometimes called "refutation by logical analogy" (e.g. by Copi and Cohen 2001), of challenging an inference by supplying a parallel argument with true (or otherwise acceptable) premisses and an untrue (or otherwise not acceptable) conclusion, perhaps prefixing one's challenge with the frame, "you might as well say that …" On the broader truth-transmission conception of consequence that includes non-logical consequences, a conclusion that follows from stated premisses does so in accordance with a counterfactual-supporting covering generalization that is non-trivially acceptable. If one restricts consequence to logical consequence or logical/semantic consequence, then one should look for such a generalization to add as an unexpressed premiss when one reconstructs the argument.

Proponents of the unexpressed premiss approach, however, sometimes object to the insistence that a gap-filling unexpressed premiss must be general by citing examples of what I will call "occasional arguments", which they claim have only a singular unexpressed premiss. Woods (2004, pp. 249–250) cites the argument:

(21) It's raining, so Eveline won't be driving to Calgary.

Although he does not describe the context of utterance of this apparently actual argument, it is a reasonable assumption that no counterfactual supporting covering generalization (such as 'Eveline doesn't drive when it's raining' or 'Unless it's an emergency, Eveline won't drive long distances when it's raining') is acceptable. The conclusion follows, we may suppose, in virtue of particulars of the occasion of utterance of the argument rather than in virtue of some covering generalization.

Robert Ennis claimed about a similar example that the gap-filling unexpressed premiss was the argument's associated singular conditional:

(22) … when Michael Scriven and I were trying to find our way to Detroit airport in the car he rented, I said at one point, "The sign says 'Chicago' [to the right], so we should turn right there." (We were trying to get on I 94 going to the airport.) There was no generalization there (this is clear from the situation) and I would resist one. It was straight modus ponens, if anything. (e-mail communication, 2009 June 8)

Ennis later clarified in personal correspondence that he would not interpret the singular associated conditional that he took to be an unexpressed premiss of his argument as a material conditional. Aside from assuming that it licenses *modus ponens*, he did not ascribe truth-conditions to it. Much like Verheij, he envisaged it as an inferential conditional asserting that the conclusion of the stated argument follows from its premiss.

The inference in an occasional argument like those in examples (21) and (22) applies, on its face, only to the particular situation that is the occasion of its utterance. The word 'occasional' echoes Quine's use of the phrase 'occasion sentences' for sentences whose truth-value is partly a function of the occasion of their utterance (Quine 1960). In the same way, the inferential goodness of occasional arguments is partly a function of the occasion of their utterance. But only partly, I shall argue. Once the relevant particular features of the occasion are specified, the conclusion follows if and only if some counterfactual-supporting covering generalization is non-trivially acceptable.

To understand an occasional argument, someone not present on the occasion of its utterance needs to know who uttered it, what particular individuals are being referred to by its constituent proper names and definite descriptions, and what background knowledge about those particular individuals is being taken for granted as shared between the arguer and the argument's addressees. Consider for example the argument cited by Ennis in example (22):

(23) The sign says 'Chicago' [to the right], so we should turn right there.

Ennis himself evidently found it necessary (or at least useful) to give part of the relevant background information in his e-mail communication: "Michael Scriven

and I were trying to find our way to Detroit airport in the car he rented… We were trying to get on I 94 going to the airport." To complete the picture, we need to know that they were on I 96, having come across the Ambassador Bridge from Windsor. The sign on the right to which Ennis referred is located about half a mile before the exit to I 94. It reads: "I 94 West Chicago/I 94 East Port Huron". To fully understand the argument of example (23), we should add this additional information as unexpressed premisses mutually believed by both arguer and addressee:

(24) We are trying to find our way to Detroit airport. We are trying to get on I 94 going to the airport. We are on I 96, having come across the Ambassador Bridge from Windsor. The sign says 'Chicago' [to the right]. So we should turn right there.

Thus expanded with the information required for someone not present on the occasion to understand the argument, the argument fits very well the approach of the present chapter. The argument is an instance of the scheme:

(25) x is trying to find x's way to Detroit airport. x is trying to get on I 94 going to the airport. x is on I 96, having come across the Ambassador Bridge from Windsor. The sign says 'Chicago' [to the right]. So x should turn right there.

This argument scheme has no actual or counterfactual instances with true premisses and an untrue conclusion, even though it has an actual instance with true premisses (namely, the argument of example 24) and an actual instance with an untrue conclusion (for example, the instance in which the variable *x* is replaced with the name of someone at the same spot on I 96 who intends to continue on that freeway past its intersection with I 94). Thus, the conclusion of the argument in example 24 follows from its premisses, since it is an instance of the scheme in example 25. The validity of that scheme corresponds to the truth of the covering generalization of the argument that anyone on I 96 who has come across the Ambassador Bridge from Windsor and is trying to get on I 94 going to the Detroit airport should turn right where the sign says "Chicago" to the right. And this covering generalization is non-trivially true, and supports counterfactual instances, as is required for the conclusion of the argument to follow from its premisses. It should be construed as temporally restricted to a specious present with indefinite boundaries, like the inference-licensing covering generalization of the Obama argument of example 6.

I suspect strongly that all occasional arguments will yield to a similar treatment. In other words, if the conclusion of an occasional argument intuitively follows from its premisses, it will follow from them in accordance with a non-trivially acceptable counterfactual-supporting covering generalization once the stated premisses are supplemented with the additional information about the occasion of the argument's utterance that is necessary for someone not present on that occasion to understand the argument. I invite readers to test this claim by working through an occasional argument that they themselves have experienced as arguer or addressee.

Occasional arguments exhibit the kernel of truth in the unexpressed premiss approach. Such arguments do need gap-filling supplementation by information about the topic of the argument (i.e. the individual person or thing referred to in

both premisses and conclusion), information that is taken for granted as known (or at least believed) by both arguer and addressees. But this supplementation usually does not produce an argument that is formally valid. Rather, it produces an argument with an inference-claim that is at least arguably correct, in the sense that some non-trivially acceptable counterfactual-supporting covering generalization licenses the drawing of the conclusion from the supplemented premiss set. In general, the function of such context-available information is to narrow the scope of an obvious covering generalization so that it is a plausible candidate for being non-trivially true and supporting counterexamples. In the argument of example 23 about turning right where the sign says "Chicago", for example, the additional premisses narrow the scope of the generalization that one should turn right where the sign says "Chicago" from all persons to all persons in a specious present who are travelling from the Ambassador Bridge on I 96 and trying to get on I 94 going to Detroit airport.

8.8 Summary

Contemporary logicians generally construe consequence as formally necessary truth-preservation: a purely formal feature rules out that the implicans is true while the implicatum is untrue. Two objections can be raised to this conception. First, it counts something as a consequence simply because a purely formal feature rules out that the implicans is true or simply because a purely formal feature rules out that the implicatum is untrue. Second, it rejects something as a consequence when a general but not purely formal feature rules out a true implicans and untrue implicatum. An alternative truth-transmission conception holds that a consequence relation obtains when and only when a general feature rules out that the implicans is true while the implicatum is untrue, even though it does not rule out that the implicans is true and does not rule out that the implicatum is untrue. Both conceptions can be given substitutional, model-theoretic or schematic articulations. However, each of these three articulations of the truth-transmission conception has counterexamples where the conclusion of an argument obviously does not follow from its premisses even though the argument satisfies the articulation in question. The remedy is to abandon the substitutional and model-theoretic articulations and to modify the schematic articulation so as to require that it holds in virtue of a counterfactual-supporting covering generalization. This modification introduces an awkward asymmetry into the evaluation of arguments: covering generalizations that hold merely of actual cases have to be treated as unexpressed premisses rather than as principles licensing an inference. The suspicion that the asymmetry indicates something wrong-headed about the whole approach can be countered by noting that people rarely argue for conclusions that follow only in accordance with a covering generalization that if true would not support counterfactual instances; an explanation of their rarity is that to argue in this way is to beg the question at issue.

The modified truth-transmission conception of consequence can be elaborated and expanded in four ways: by recognizing the legitimacy of restricting the range of

the variables in an argument's schema, by generalizing from truth to acceptability to cover deontic conclusions, by allowing for conclusions that are not assertives, and by allowing for rebuttable inferences. On the elaborated and expanded account, a conclusion follows from given premisses if and only if an acceptable counterfactual-supporting covering generalization of the argument rules out, either definitively or with some modal qualification, simultaneous acceptability of the premisses and non-acceptability of the conclusion, even though it does not rule out acceptability of the premisses and does not require acceptability of the conclusion independently of the premisses.

This elaborated and expanded account is rather complex. A sceptic might find more attractive the simpler view already held by ancient logicians that the inference claim of an argument is just its associated conditional, i.e. the singular conditional whose antecedent is the conjunction of the argument's premisses and whose consequent is the argument's conclusion In response to such a sceptic, we may grant that a singular indicative conditional in one of its senses signifies that its consequent follows from its antecedent, but take the expanded acceptability-transmission account of the consequence relation to be an account of the truth-conditions of a singular indicative conditional in that sense. The alternative view that the inference claim of an argument is singular rather than general is either subject to objections or equivalent to the expanded acceptability-transmission account. The view that the unexpressed premiss of a formally invalid argument is at least sometimes the argument's associated conditional is likewise either subject to objections or equivalent to the present account.

Appendix

The universally generalized material conditional associated with the schema 'People who are *F* are very poor soldiers, so the Iraqi soldiers are not *F*' is logically equivalent to the statement that the Iraqi soldiers are not very poor soldiers.

Proof: (*L to R*) Suppose that, for any *F*, if people who are *F* are very poor soldiers, then the Iraqi soldiers are not *F*. Then in particular, by universal instantiation, if people who are identical with the Iraqi soldiers are very poor soldiers, then the Iraqi soldiers are not identical with the Iraqi soldiers. But, by the meaning of identity, the Iraqi soldiers are identical with the Iraqi soldiers. Hence, by double negation and *modus tollendo tollens*, people who are identical with the Iraqi soldiers are not very poor soldiers. In other words, the Iraqi soldiers are not very poor soldiers.

(*R to L*) Suppose that the Iraqi soldiers are not very poor soldiers. Now suppose, for conditional proof, that for an arbitrarily chosen property *F*, people who are *F* are very poor soldiers. Suppose, for *reductio*, that the Iraqi soldiers are *F*. Since they are people, they are people who are *F*, and thus are very poor soldiers, contrary to our original supposition. Hence, by reductio ad absurdum, the Iraqi soldiers are not *F*. Hence, by conditional proof, if people who are *F* are very poor soldiers, then the

Iraqi soldiers are not *F*. Hence, since we have discharged all assumptions about *F*, by universal generalization, for any *F*, if people who are *F* are very poor soldiers, then the Iraqi soldiers are not *F*. QED.

The proof uses only rules of inference that conform to the truth-transmission sense of consequence. It can be imitated for any argument in which an additional singular premiss would make the argument formally valid. Any singular statement is thus equivalent to a second-order universal generalization, which if it supports counterfactual instances can license inferences.

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Chapter 9
Material Consequence and Counterfactuals

Abstract A conclusion is a "material consequence" of reasons if it follows necessarily from them in accordance with a valid form of argument with content. The corresponding universal generalization of the argument's associated conditional must be true, must be a covering generalization, and must be true of counterfactual instances. But it need not be law-like. Pearl's structural model semantics is easier to apply to such counterfactual instances than Lewis's closest-worlds semantics, and gives intuitively correct results.

9.1 Introduction

Good arguers support their claims with reasons from which the claim actually follows. To clinch the argument, the claim would have to follow necessarily, in the sense that it is not possible for the reasons to be true and the claim untrue. The claim can follow necessarily in virtue of a contentless form of one's argument, as when one argues by *modus tollens*:

(1) There is no life on Mars, since its atmosphere is in a static equilibrium and its atmosphere would not be in a static equilibrium if there were life there.

But it can also follow necessarily in virtue of a contentful form of one's argument, as when one argues more succinctly (and more naturally):

(2) There is no life on Mars, since its atmosphere is in a static equilibrium.

The contentful form of argument in virtue of which the claim now follows is: The atmosphere of planet *x* is in a static equilibrium, so there is no life on planet *x*. This

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second way in which a claim can follow necessarily from reasons has come to be known, following Sellars (1948, 1953), as *material consequence*. It has been discussed by Bolzano (1972/1837), Peirce (1955/1877), Ryle (1950), Toulmin (1958), George (1972, 1983), Hitchcock (1985, 1998, 2011), Brandom (1994, 2000), Pinto (2006) and Freeman (2006, 2011).

9.2 Covering Generalizations

Material consequence evidently requires the truth without exceptions of some contentful generalization of what I shall call the argument's 'associated conditional': the material conditional whose antecedent is the conjunction of the reasons and whose consequent is the claim. Otherwise the argument would not have a valid contentful form in virtue of which the claim follows.

Material consequence also requires that at least one variable in a true generalization of its associated conditional be shared by its antecedent and consequent. Otherwise it would reduce to the *consequentia materialis* of medieval logicians, a relation guaranteed by either the truth of an argument's conclusion or the falsehood of one of its reasons. For, if the conclusion is true, one could construct a true generalization of the argument's associated conditional by generalizing over some content in the reasons that does not occur in the conclusion. Consider for example the argument:

(3) *Mars is a planet, because trees grow.[1]

A generalization of the associated conditional of this argument is that Mars is a planet if things of some kind grow, which is logically equivalent to the true proposition that Mars is a planet.[2]

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[1] *Added in the present republication*: In this chapter, an asterisk in front of a sample argument indicates that intuitively its conclusion does not follow from the premiss.

[2] *Correction in the present republication*: The original article claimed falsely that the generalization in question is logically equivalent to the proposition that, if there is some kind K such that every K grows, then Mars is a planet. The proof of the logical equivalence of the generalization to the statement that Mars is a planet runs as follows:

Left to right: Suppose that, for every kind *K*, if *K*s grow, then Mars is a planet. Then, by universal instantiation, if growing things grow, then Mars is a planet. But, as a matter of logic, growing things grow. So Mars is a planet.

Right to left: Now suppose that Mars is a planet. Then, by one of the paradoxes of material implication, if for some arbitrary kind *X* that *X*es grow, then Mars is a planet. Hence, by universal generalization, for every *K*, if *K*s grow, then Mars is a planet. QED

In general, a universal generalization over a content expression that occurs only in the antecedent of an argument's associated conditional is logically equivalent to the argument's conclusion, by the reasoning of the above proof.

Similarly, if a reason is false, one could construct a true generalization of the argument's associated conditional by generalizing over some content in the conclusion that does not occur in the reasons. Consider for example the argument:

(4) *Some cows are reptilian mammals, because Mars is a star.

A generalization of the associated conditional of this argument is that there are reptilian mammals if Mars is a star, which is logically equivalent to the true proposition that Mars is not a star.[3]

The problem with such examples is that the generalization of the associated conditional is only *trivially* true: it is true either merely because any instance of it has a true consequent or merely because any instance of it has a false antecedent. A satisfactory account of material consequence must require that a generalization of the associated conditional be non-trivially true. Arguments like (3) and (4), where the initial universal quantifiers in the only true generalizations of the associated conditional bind variables that occur either only in the antecedent or only in the consequent, can be rejected as invalid if one adds to the requirement of a true generalization of the associated conditional that at least one initial universal quantifier in the generalization binds a variable that occurs both in the antecedent and in the consequent. I shall call such a generalization a 'covering generalization' of the argument.

9.3 Non-triviality

Requiring that an argument have a true covering generalization is however not enough to exclude cases where generalizations of the associated conditional are true only trivially. For covering generalizations too can be true only because they are trivially true. Consider for example the argument:

(5) *Mars is a planet, because Mars is a star with no mass.

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[3] *Correction in the present republication*: The original article claimed falsely that the generalization in question is logically equivalent to the proposition that there are reptilian mammals if Mars is a star. In fact, the generalization is logically equivalent to the true proposition that Mars is not a star. The proof is as follows.

From left to right: Suppose that, for any kind *K*, if Mars is a star, then some Ks are reptilian mammals. Then, by universal instantiation, if Mars is a star, then some non-reptilian mammals are reptilian mammals. But, as a matter of logic, no non-reptilian mammals are reptilian mammals. Hence, by *modus tollendo tollens*, Mars is not a star.

From right to left: Suppose that Mars is not a star. Then, by one of the paradoxes of material implication, if Mars is a star. then for some arbitrary kind *X*, some *X*es are reptilian mammals. Hence, by universal generalization, for any kind *K*, if Mars is a star, then some *K*s are reptilian mammals.

In general, a universal generalization over a content expression that occurs only in the consequent of an argument's associated conditional is logically equivalent to the contradictory of the conjunction of the argument's premisses, by the reasoning of the above proof.

A generalization of the associated conditional of this argument is that stars with no mass are planets. This generalization is true, but only because there are no stars with no mass. The same point can be made about generalizations that are true only because their instances always have a true consequent. Consider the argument:

(6) *Mars has mass, because it is visible from Earth in the night sky.

The generalization that any celestial object visible from Earth in the night sky has mass is true, but only because every celestial object has mass. (In this example, the variable bound by the universal quantifier has been given a range restricted to celestial objects; let us call such a range 'the universe of discourse'. Restriction of the universe of discourse to a well-defined class is clearly legitimate if there is well-supported background knowledge that the subject common to the claim and its supporting reasons belongs to that class, e.g. that Mars is a celestial object. Compare example (2) in the introduction, where the contentful valid form of argument restricts the range of the variable to planets.)

A first response to this problem is to require that an inference-licensing covering generalization not only be true but also have an instance with a true antecedent and an instance with an untrue consequent (Hitchcock 1998). Alas, it turns out that this requirement is in one way too strict and in another way not strict enough.

As to its being too strict, consider some suppositional reasoning where we assume that some object has a property that we know nothing has—a non-instantiated property. Then consider some other property that according to the laws of physics, say, our imagined object would have if it had the non-instantiated property. Then it seems to follow that our imagined object has that other property. For example, we might suppose that a block of gold has a volume of one cubic metre. Given the density of gold (19,300 kg/m^3), this block would have a mass of 9.65 metric tonnes. So the following argument would be valid:

(7) This block of gold has a volume of one cubic metre. So its mass is 9.65 metric tonnes.

But the true covering generalization that would license the inference in this argument—the generalization that any block of gold with a volume of one cubic metre has a mass of 9.65 metric tonnes—has, we may suppose, no instance with a true antecedent. However, the absence of such an instance is not the sole reason why the covering generalization is true; another reason why the covering generalization is true is that gold has a density of 19,300 kg/m^3.

A similar point can be made about a property that every object in the universe of discourse has—an always instantiated property. Suppose that the laws of physics enable one to infer the presence of such an always instantiated property from some property belonging to all instances of some kind. For example, no physical object over the course of its existence both has and lacks mass. Now the laws of physics enable one to infer from the fact that something is an elementary particle of a certain sort what its mass is, and so a fortiori that it does not both have and lack mass. So someone might argue:

(8) Photons do not both have and lack mass, since photons are elementary particles.

The conclusion of this argument seems to follow, in virtue of the true covering generalization that no elementary particle both has and lacks mass. But this generalization has no instance with an untrue consequent. Nevertheless, it licenses the inference in our sample argument, because there is another reason why it is true, namely that every elementary particle has a definite mass (which may be zero, as in the case of photons).

The requirement of an instance with a true antecedent and an instance with an untrue consequent is however not only too strict. In another way, it is not strict enough. For, in some arguments with a true covering generalization that meets this requirement, the conclusion intuitively does not follow from the reasons given. Consider for example the argument:

(9) *Napoleon was short, because he ruled France and was exiled to Elba.

Here the covering generalization that all rulers of France exiled to Elba were short is true. Further, it meets the additional requirement: it has an instance with a true antecedent (the one concerning Napoleon) and an instance with a false consequent (any instance concerning someone who was not short, such as Giscard d'Estaing). But Napoleon's shortness obviously does not follow from the stated facts of his biography, which are epistemically irrelevant to his height (Hitchcock 2011). Similar counterexamples can be constructed for any class of individuals that happen to share a property distinct from but not in any way determined by those defining the class. It is said, for example, that the world's largest gold bar weighs 250 kg,[4] and we may suppose that, in view of the cost of making a gold bar, no gold bar will ever weigh more than 500 kg. If so, the generalization that no gold bar weighs more than 500 kg is true, and it meets the additional requirement: there are gold bars, and there are things that weigh more than 500 kg (for example, cars). But intuitively the following argument is not valid:

(10) *This block is a gold bar. So it weighs no more than 500 kg.

9.4 Counterfactuals

How then can we rule out cases where covering generalizations are true only trivially without ruling out such apparently meritorious arguments as those concerning the weight of a hypothetical cubic-metre block of gold (example 7) and concerning a photon's not both having and lacking a mass (example 8), and without counting in such apparently unmeritorious arguments as those concerning Napoleon's height (example 9) and concerning the weight of a gold bar of unstated volume (example 10)? In examples 7 and 8, the two clauses proposed as means to

[4] http://www.weirdasianews.com/2010/02/16/japan-pours-worlds-largest-gold-bar/; accessed 2016 08 09.

block trivially true covering generalizations end up blocking covering generalizations that are true non-trivially. So we need to relax or replace those two clauses in such a way as to admit as inference-licensing at least some generalizations that are true non-trivially even though they either have no instances with a true antecedent or have no instances with an untrue consequent. In examples 9 and 10, on the other hand, the two clauses proposed as means to block trivially true covering generalizations failed to block true covering generalizations that intuitively do not license inferences. So we need to tighten up or replace those two clauses in such a way as to rule out, as not able to license an inference, true generalizations that satisfy the two clauses but whose consequent is, we might say, merely accidentally related to their antecedent, as Napoleon's height is to his rule and exile, and as weighing less than 500 kg is to being a gold bar.

What seems to be at issue in the counterexamples is whether the generalization's truth-value can be determined independently of knowing the truth-value of its instances. The cubic-metre-block-of-gold argument (7) and the photon argument (8) each have a covering generalization whose truth-value can be determined without taking into account whether it has instances with a true antecedent or whether it has instances with an untrue consequent, and a fortiori independently of the fact that the generalization in fact has in the one case no instances with a true antecedent and in the other case no instances with an untrue consequent. On the other hand, the true covering generalization of the Napoleon argument (9) can only be determined to be true by discovering that the one instance with a true antecedent happens to also have, as a matter of separately determined fact, a true consequent. The problem with the gold-bar argument (10) is more difficult to characterize. Perhaps the best account of the problem is that the truth-value of its true covering generalization, that no gold bar weighs more than 500 kg, can be determined only by reflecting on the rather extrinsic and accidental reasons for its lacking a counterexample. There is nothing about being a gold bar that precludes it from weighing more than 500 kg.

It appears that counterexamples of both sorts can be avoided by shifting to a requirement that an argument have a covering generalization that is true not just of actual instances but also of hypothetical instances. Thus, in example (7), although there is no block of gold with a volume of one cubic metre, there *could* be such a block, and it *would* have a mass of 9.65 metric tonnes, in view of the density of gold. In example (8), although no physical object both has and lacks mass, there *could* be such an object, and it *would not* be a photon, in view of the fact that every photon has for its entire existence zero mass. In example (9), although there are no *actual* counterexamples to the minimal covering generalization that all rulers of France exiled to Elba were short, there is a *hypothetical* counterexample: Jacques Chirac, the former president of France, *need not*, and indeed *would not,* have been short if he had been exiled to Elba. In example (10), although there are (we might suppose) no *actual* counterexamples to the minimal covering generalization that no gold bars weigh more than 500 kg, there is a *hypothetical* counterexample: a gold bar *need not*, and indeed *would not*, weigh no more than 500 kg if it were more than twice the volume of the largest gold bar now in existence, which weighs 250 kg.

Does this revised account of material consequence rule out arguments like examples 5 and 6, where a covering generalization is true only trivially, i.e. merely because it has no instance with a true antecedent or merely because it has no instance with an untrue consequent? With the argument from Mars' supposedly being a star with no mass to its being a planet (5), the minimal covering generalization has hypothetical counterexamples, even though it has no actual ones: there *could* be a star with no mass, and it *need not*, and indeed *would not*, be a planet. Similar hypothetical counterexamples could be generated for other arguments where the only reason that its minimal covering generalization has no actual counterexamples is that it has no instance with a true antecedent. Consider for example the following parallel to example 5:

(11) *This figure is both a circle with a diameter of non-zero length and a square whose sides are of non-zero length. So it has an area of at least nine square centimetres.

For brevity, let us call a figure that is both a circle with a diameter of non-zero length and a square whose sides are of non-zero length a *squircle*. The minimal covering generalization of argument 11 is that a squircle has an area of at least nine square centimetres. Here again, although there are no actual counterexamples to this generalization, there are hypothetical ones: there *could* be a squircle (if space were different),[5] and it *need not* have an area of at least nine square centimetres; indeed it *would not* have that large an area if, for example, its sides were two centimetres long. In contrast, the following argument is valid:

(12) This figure is a squircle. So it has a non-zero area.

Consider the covering generalization that a figure has a non-zero area if it is a squircle. This generalization is true, because its instances with a hypothetically true antecedent have a consequent that is also true in the hypothetical situation. There *could* be a squircle, and it *would* have a non-zero area, namely the square of the length of its sides.

A similar vindication of the requirement that an inference-licensing covering generalization support counterfactual instances comes with a consideration of example 6, the argument from Mars' visibility from Earth in the night sky to its having mass. Any covering generalization of this argument has hypothetical counterexamples: there *could* for example be a celestial object that does not have mass, e.g. a hypothetical star with no mass, and it *need not* be invisible from Earth in the night sky. Here again the reason for finding this argument invalid seems to generalize to all cases where a covering generalization is true only because it has no actual instances with an untrue consequent. Consider the argument:

[5] *Added in the present republication*: Not being a topologist, I don't know how there could be such a space. But there seems nothing logically impossible in having a space with peculiar planes in which a figure in the plane whose boundary consisted of points equidistant from some point in the plane would be bounded by four straight lines of equal length whose adjacent sides were at right angles to each other.

(13) *Hyenas are carnivores, so they are products of evolution.

Here the minimal covering generalization that all carnivores are products of evolution has no actual counterexamples, simply because all living organisms on Earth, whether carnivores or not, are products of evolution. There *could* however be an organism on Earth that was not a product of evolution, e.g. one created in a laboratory, and it *need not* be a non-carnivore. So the covering generalization, though true of the actual world, does not support counterfactual instances. Again, as with the two arguments 11 and 12 about a squircle, there is a parallel argument to argument 13 that is valid:

(14) Birds are descended from theropod dinosaurs, so they are products of evolution.

Here the minimal covering generalization that all descendants of theropod dinosaurs are products of evolution is true not only of actual instances but also of hypothetical instances. If there were currently living descendants of theropod dinosaurs other than birds, they too would be products of evolution. Also, if there were living organisms on Earth that were not products of evolution, they would not be descended from theropod dinosaurs.

To sum up: A conclusion follows from given reasons if the argument has a covering generalization with neither actual nor hypothetical counterexamples.

9.5 Semantics

This conception of material consequence might have been arrived at more directly by reflecting on the fact that following *necessarily* requires a form of argument that lacks not only *actual* counterexamples but also *possible* (i.e. hypothetical) counterexamples. With formal consequence, there is no need to consider hypothetical situations, since set-theoretic reasoning can establish that the standard model-theoretic conception will generate all the possibilities against the background assumption of the actual world as it is (Sher 1996). With material consequence, on the other hand, considering all the possible counterexamples to a contentful form of argument requires attention to hypothetical situations, since substitutions or interpretations against the background assumption of the world as it is will in general not exhaust the possibilities.

Attention to hypothetical situations, however, has its own theoretical problems. How is one to determine that, in some instance of a covering generalization, an antecedent that is actually untrue nevertheless *could* be true? If it could, how is one to determine whether the consequent *would* be true in such a hypothetical situation? Similarly, how is one to determine that the actually true consequent of a covering generalization's instance *could* nevertheless be untrue? If it could, how is one to determine whether the antecedent *would* be untrue in such a hypothetical situation? In the cases we examined, it seemed straightforward to make the required determinations. We had no difficulty in thinking of how an actually untrue antecedent

could be true: a block of gold *could* have a volume of one cubic metre (7), another ruler of France *could* have been exiled to Elba (9), there *could* be a star with no mass (5), a gold bar *could* have a volume more than twice that of the largest gold bar now in existence (10), there *could* be a squircle (11 and 12), a carnivore *could* be created in a laboratory (13), and there *could* be a living descendant of theropod dinosaurs that was not a bird (14).[6] And we had no difficulty in figuring out whether in such a hypothetical situation the consequent *would* be true: the block of gold (7) *would* have a mass of 9.65 metric tonnes, the other ruler of France exiled to Elba (9) *need not* have been short, the star with no mass (5) *need not* and indeed *would not* be a planet, the gold bar (10) *need not* and indeed *would not* weigh no more than 500 kg, the squircle *need not* have an area of at least nine square centimetres (11) but *would* have a non-zero area (12), and the laboratory-created carnivore (13) *need not* be a product of evolution but the non-avian living descendant of theropod dinosaurs (14) *would*. Similarly, we had no difficulty in thinking of how an actually true consequent *could* be untrue: a celestial object *might* have no mass (6) and a physical object *might* at different periods in its history have mass and lack mass (8). And we had no difficulty in figuring out whether in such a hypothetical situation the antecedent *would* be untrue: the celestial object with no mass (6) *need not* be invisible from Earth in the night sky, and the physical object that both had and lacked mass (8) *would not* be a photon.

In general, in these cases we are relying on law-like generalizations whose truth-value is determined by the presence or absence of a law of nature, a theorem of geometry, or conventional meanings of terms. Such law-like generalizations are true if and only if they support counterfactual instances. Could one then reduce the concept of material consequence to the existence of a true law-like covering generalization?

It appears not. For we can think of arguments whose conclusion intuitively seems to follow, in virtue of a true covering generalization that supports counterfactual instances, even though the generalization is not law-like. Consider for example the following argument:

(15) President Obama lives in Washington, because he lives in the White House.

One could imagine this argument addressed to someone who thought that Obama merely used the White House as his office, and lived somewhere else, commuting to work. Such a person might not be sure what city Obama lived in. Argument 15 should be a convincing argument for them, as long as they accept the supporting reason on the say-so of its author. For the conclusion obviously follows, in virtue of the covering generalization that whoever lives in the White House lives in

[6] *Added in the present republication*: The last example is a counterfactual instance of the antecedent of the covering generalization of argument (14) that all descendants of theropod dinosaurs are products of evolution. It happens that all living descendants of theropod descendants are birds. But the evolutionary branch stemming from theropod dinosaurs might have divided into birds and some other major groups of animals, in the same way that early reptiles evolved into lizards, turtles and other large groups of animals.

Washington. And this covering generalization supports counterfactuals: if Mitt Romney lived in the White House, he would live in Washington. But there is no law of nature or mathematical theorem or conventional definition underpinning this generalization. What makes it true, even in counterfactual instances, is the combination of the purely contingent fact that the plot of ground in which the White House is situated, at 1600 Pennsylvania Avenue, is located in the city of Washington, D.C., with the law-like transitivity of the relation of being within: if *x* lives in building *y* and *y* is located in city *z*, then *x* lives in city *z*.

At the 2011 OSSA conference, in discussion of a presentation subsequently published as (Hitchcock 2011), Robert Ennis challenged my claim that example 15 had a covering generalization that supported counterexamples, on the ground that, for example, if Vladimir Putin lived in the White House, it would be in Moscow. This challenge raises the vexed question of how in general we determine the truth-value of counterfactuals. If Vladimir Putin did live in the White House, in what city would he be living?

There are two aspects to such a question. The first is the determination of whether there even *could* be a hypothetical situation in which the false antecedent of the given instance of the covering generalization was true: *could it be* that Vladimir Putin lived in the White House? The second is the determination of whether in such a hypothetical situation the consequent of the given instance of the covering generalization *would have to be* true: *would* Putin live in Washington?

There are currently at least two major candidates for a theoretical analysis of the truth-conditions for counterfactuals: the closest-world semantics of Lewis (1973) and the structural model semantics of Pearl (2009) and his collaborators. According to Lewis's closest-world semantics, a counterfactual conditional is true if and only if, in every possible world closest to the actual world, the consequent is true if the antecedent is true. In other words, there is no closest possible world where the antecedent is true and the consequent untrue. The difficulty with this semantics is with the construction of a measure of similarity between worlds that would enable us to identify the non-actual worlds that are similar to each other and minimally close to the actual world. In terms of our example, a possible world in which Putin lives in the White House is closer to the actual world if in it Putin lives in Moscow than if in it he lives in Washington, provided that all other things in the two possible worlds are the same. But they would not be the same in those two possible worlds. A world in which Putin lived in the White House and lived in Moscow would require the White House to be in Moscow rather than Washington, assuming that the phrase 'live in' here has the force of picking out the location of a person's principal residence. A world in which Putin lived in the White House and lived in Washington would have the White House still in Washington. Is a world in which Putin lives in the White House and it is in Moscow closer to the actual world than one in which he lives in the White House and has moved to Washington? Or is it farther away? Or are they equally close? In principle, one possible world is just as close to the actual world as another possible world if each of the two possible worlds has the same number of atomic propositions with a truth-value different from their truth-value in the actual world. And one possible world is closer to the

actual world than another if it has fewer atomic propositions than that other world with a truth-value different from their truth-value in the actual world. The difficulty in such examples is to determine which atomic propositions would have a different truth-value in a given possible world. What else would, or might, be the case in a possible world in which Putin lived in the White House? The situation is so different from the actual world that we cannot begin to work out the other changes that would have to occur. Perhaps the result of applying Lewis's semantics to our example would be that there is no closest world in which Putin lives in the White House, and hence that a fortiori there is no closest world in which Putin lives in the White House and does not live in Washington. If this is the correct result, then on Lewis's closest-world semantics it is (vacuously) true that Putin would live in Washington if he lived in the White House.

Lewis's closest-world semantics seem to give the intuitively correct result in cases where the counterfactual situation needs relatively few adjustments to our actual situation, so that there is a closest world where the antecedent is true. In a close possible world where Mitt Romney lived in the White House, Romney would have won the U.S. presidential election in November 2012. Other ways in which we could imagine Romney coming to live right now (in May 2013) in the White House would involve far more changes to the truth-value of atomic propositions than those involved in supposing that Romney had won the election instead of Obama. And, if Romney had won the election and so now lived in the White House, he would live in Washington. So, in the closest worlds in which Romney lives in the White House, he also lives in Washington. Hence, on Lewis's closest-world semantics Romney would live in Washington if he lived in the White House.

Pearl's structural model semantics interprets counterfactual conditions in terms of a hypothetical change to equations in a causal model defined by functional causal relationships among variables (Pearl 2009, p. 205). The change to the equations simulates an external action or spontaneous change that alters the course of history, with minimal change of mechanisms. A causal model of how people come to live in the White House, for example, would include a number of pathways: election as U.S. President and subsequent inauguration, becoming in one way or another part of the immediate co-habiting family of someone who becomes or is U.S. president, joining that part of the White House cleaning and cooking staff that lives in the White House, being invited to stay temporarily as a special guest in the White House. In this causal model, such variables as the geographical location of the White House and the boundaries of the city of Washington, D.C., would be background (exogenous) variables determined by factors outside the model.[7] The counterfactual situation that Vladimir Putin lives in the White House, given that he is the President of Russia, could only come about in the causal model by his staying temporarily as a special guest; we can exclude as not even remote possibilities his

[7]*Added in the present republication*: They are exogenous in virtue of what is known about how people come to live in the White House. The causal pathways leading to their taking up residence n that building do not include references to its geographical location or to the boundaries of Washington, D.C.

entering into a bigamous union with Michelle Obama (or with Barack) or becoming a member of President Obama's live-in cleaning or cooking staff. But, in any case, the geographical location of the White House and the boundaries of the city of Washington, D.C. are exogenous background variables, whose value remains the same in any hypothetical situation where someone is assumed to live in the White House who actually does not live there. Since the White House is currently located at 1600 Pennsylvania Avenue and that location is within the boundaries of the city of Washington, D.C., then on Pearl's structural model semantics Vladimir Putin would live in Washington if he lived in the White House.

It should be noted that the consequence relation in virtue of which Obama's living in Washington follows from his living in the White House is what medieval logicians called a *consequentia materialis ut nunc*. It holds only "*ut nunc*", i.e. for now. Future changes to the geographical boundaries of Washington, D.C., or construction of a new "White House" outside those geographical boundaries, could bring it about that people who live in the White House do not live in Washington. The conclusion of argument 15 therefore follows not only materially rather than formally, but also for the time being rather than for all time.

Here is another argument where the conclusion appears to follow in accordance with a covering generalization that supports counterfactual instances, even though it is not law-like:

(16) Every human being is mortal, so Socrates is mortal. (Freeman 2011, p. 183)

The covering generalization that Socrates possesses every property that every human being possesses (for every F, if every human being is F, then Socrates is F) supports counterfactual instances: if every human being were kind, then Socrates would be kind; if every human being had four stomachs, then Socrates would have four stomachs; and so on. But the generalization is not law-like. It is logically equivalent to the proposition that Socrates is a human being, which is a contingent particular fact—contingent because, for example, he might have been an alien. As with the previous example, Pearl's structural model semantics appears to give a better account of why the generalization supports counterfactual instances than does Lewis's closest-world semantics. A causal model of the mechanisms that make Socrates mortal would appeal to various components of his humanity, and ultimately to genetic factors inherited from his parents. A counterfactual instance would alter those aspects of the causal model that affect the variable at issue: the factors responsible for making a human being kind or cruel or indifferent, the mechanisms responsible for the formation of a single stomach in each human being, and so on. The status of Socrates as a human being would not change with such changes, since his species is basic to who he is.

In contrast, if the argument's reason appealed to some causally irrelevant property whose possessors just happened to be mortal, the conclusion would not follow. Consider for example the argument:

(17) *Every two-legged organism is mortal, so Socrates is mortal.

It is true that Socrates possesses every property that every two-legged organism possesses, but this covering generalization (for every *F*, if every two-legged organism is *F*, then Socrates is *F*) does not support counterfactual instances. Suppose for example that every two-legged organism is a reptile. The causal model showing the evolution of species on Earth would then need to be changed to accommodate this counterfactual assumption. Given the direction of the causal mechanisms that have produced both two-legged reptiles (some dinosaurs, birds) and two-legged mammals (human beings, hominids), the change to the causal model to make only reptiles two-legged would involve an evolutionary history in which the ancestors of human beings did not make the shift from being four-legged to being two-legged.[8] In that case, Socrates would be four-legged.

In these three examples, it appears that Pearl's structural model semantics is more easily applicable than Lewis's closest-world semantics to the determination of the truth-value of a singular counterfactual conditional, and that it gives intuitively correct results.

9.6 Summary

This paper has explored the conditions under which the conclusion of an argument follows materially from the reasons given, where following materially is understood as following in accordance with a contentful valid form of argument. Validity of such a contentful form obviously requires the truth of the corresponding universal generalization of the argument's associated conditional, the material conditional whose antecedent is the conjunction of the argument's premisses and whose consequent is the argument's conclusion. This generalization needs to be a covering generalization, in the sense that at least one variable bound by its initial universal quantifiers occurs both in the antecedent and the consequent. But the requirement of a true covering generalization is not enough to rule out as invalid arguments whose true covering generalizations are only trivially true—i.e. true either only because the generalization has no instances with a true antecedent or true only because it has no instances with an untrue consequent. It is tempting to rule out such trivial cases by requiring that an inference-licensing covering generalization have at least one instance with a true antecedent and at least one instance with an untrue consequent. But this restriction both rules out some intuitively valid arguments and fails to rule out some intuitively invalid arguments. The restriction that appears to give just the right results is to require that an inference-licensing generalization supports counterfactual instances. The requirement of support for counterfactual instances can be motivated as not merely ad hoc by attending to the *explicandum* of an

[8] *Correction in the present republication*: The original article had "from being two-legged to being four-legged" instead of "from being four-legged to being two-legged".

account of material consequence: the conclusion is to follow *necessarily* from the reasons given.

Law-like generalizations support counterfactual instances. But so, as it turns out, do some generalizations that are not law-like. There are at least two accounts available of the conditions under which a counterfactual singular conditional is true: the closest-worlds semantics of David Lewis (1973) and the structural model semantics of Judea Pearl (2009). It appears from exploration of examples that Pearl's structural model semantics is more easily applied than Lewis's closest-world semantics to determining the truth-value of counterfactual instances of a covering generalization, and that it gives intuitively correct results.

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Chapter 10
Postscript

Abstract The supposed "missing premisses" attributed to arguments are generally not premisses at all but rather statements of a rule that would license the inference as it stands. Such substantive rules of inference cannot be underwritten by substitutional or model-theoretic conceptions of consequence. They need to be understood in terms of schemata. A schema is valid if and only if the generalization corresponding to it is true or analogously acceptable in both actual and counterfactual cases, even thought there might be a case where its antecedent is true and there might be a case where its consequent is untrue. Thus an argument's conclusion follows from its premisses if and only if a counterfactual-supporting covering generalization of the argument is non-trivially acceptable The kernel of truth in the missing premisses approach is that one sometimes needs to make explicit the universe of discourse over which a variable in an inference-licensing covering generalization ranges.

The six papers in the part entitled "Material Consequence" address the main problem that has occupied my attention over the last 40 years: how to evaluate an inference that is neither formally valid nor an obvious non sequitur. Such inferences are very common. In random samplings of written and spoken arguments, I found that fewer than 10% of the arguments sampled were formally valid (Hitchcock 2002, 2009) and none were obvious non sequiturs.

I started from the so-called problem of missing premisses articulated by Ralph Johnson and Anthony Blair:

> 7. *The problem of assumptions and missing premises*:
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> What exactly is a missing premise? What different kinds of assumptions can be distinguished in argumentation? Which are significant for argument evaluation? How are missing premises to be identified and formulated? Are these just practical and pedagogical questions, or theoretical as well? (Johnson and Blair 1980, p. 25)

The kind of assumption that interested me was what Ennis (1982) called a "gap-filler": an unstated premiss attributed to an argument so as to make the expanded argument formally deductively valid. Under the influence particularly of the work of George (1972, 1983), I came to realize that in general the so-called "gap-filler" was not filling a gap at all, but was the articulation of a rule of inference

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attributed to the argument, a rule that was not entirely formal. The papers in the present part trace the steps of my development of this idea.

10.1 "Enthymematic Arguments" (1985)

The article "Enthymematic arguments" (Hitchcock 1985, 1987)[1] set the framework for my subsequent articles on the issue, and is in some respects more thorough and careful than its successors. But it was still in the grip of the above-quoted formulation of the problem by Johnson and Blair, as well as of the formulation by van Eemeren and Grootendorst (1984), in that it treated the task of evaluating the inference in an enthymeme as that of first identifying its implicit assumption and then evaluating that. Although the article argued that this assumption was better regarded as the expression in statement form of a rule of inference than as an unstated gap-filling premiss, it did not take the next step of reformulating the task as one of testing the inference directly by determining whether the enthymeme had a true covering generalization. Once the problem is reformulated in this way, there is no need, at least for the purpose of evaluating the inference, to look for *the* implicit gap-filling assumption. If the argument has no true covering generalization, any such assumption will be unsatisfactory. If the argument has more than one true covering generalization, there is no need to single out one of them as the argument's gap-filling assumption. In either of these two cases, looking for the implicit assumption is a useless spinning of wheels if one's goal is to judge whether the argument has a good inference.

At the beginning of that first article, I set aside so-called non-deductive arguments, such as inductive, conductive and abductive arguments. Their exclusion was doubly unfortunate. In the first place, it betrayed the insight of my earlier papers on deduction and induction, one of which is reprinted in Part I of the present volume, in which I argued that the inductive-deductive distinction was primarily a distinction between types of support. Only secondarily could one classify arguments as inductive, deductive or whatever, on the basis of what type of support their authors were claiming to offer for their conclusion, or what type of support the situation demanded. In response to objections, I had conceded that one could classify an argument as deductive if one thought it appropriate to judge its inference by a deductive standard, and on a similar basis one could classify it as inductive, conductive, abductive or whatever. But such classifications would have to be a matter of judgment. There might be cases where one could defend more than one classification of an argument. Hence it was misleading to talk of inductive, conductive and abductive arguments.

[1]The 1985 publication, which is the one reprinted in the present volume, is a revision (in response to referees' comments) of the 1987 publication, which appeared in the proceedings of the 1986 International Conference on Argumentation. The oddity of the dates is due to delayed publication of the 1985 volume of *Informal Logic*, which actually appeared in 1986. The proceedings of the 1986 conference appeared in 1987.

In the second place, the position of the article that every enthymeme assumes the truth of a universal generalization of its associated conditional is easily extended to so-called inductive, conductive and abductive arguments, by allowing for such covering generalizations to be less than strictly universal, holding either generally, or in the absence of overriding considerations or criteria or signs, or even (when the conclusion is qualified by 'may') just sometimes. I explored this extension of the position in subsequent articles on conduction (Hitchcock 1994) and reasoning by analogy (Hitchcock 1992), which I have somewhat artificially located in a different part of the present volume, Part III on patterns of reasoning.

The attempt in that first article to define formal deductive validity for natural languages was something of a Don Quixote exercise. The article defined an argument as formally deductively valid if and only if no uniform substitution on the argument's atomic content expressions produces an argument with true premisses and a false conclusion. It paid some attention to the apparent counterexamples where an argument was evidently formally deductively valid but seemed to have a parallel with true premisses and a false conclusion. But that attention was not thorough enough. The vagaries of natural language make it easy to find real counterexamples to the definition. For example, in general switching the order of two conjuncts is a valid inference. Thus one can safely conclude from the fact that in 1941 Japan attacked Pearl Harbor and Hitler declared war on the Soviet Union that in 1941 Hitler declared war on the Soviet Union and Japan attacked Pearl Harbor. But substituting 'the United States' for 'Hitler' and 'Japan' for 'the Soviet Union' produces an argument with true premisses and a false conclusion: it is true to say that in 1941 Japan attacked Pearl Harbor and the United States declared war on Japan, but false, or at least misleading, to say that in 1941 the United States declared war on Japan and Japan attacked Pearl Harbor. To take another example: contraposition of conditionals is generally valid, but has exceptions if one sticks to natural language: it may be true that if the baby cries the care-giver will rock the baby but false that if the care-giver does not rock the baby will not cry. One cannot escape the need to recast some sentences of natural language in a canonical notation so that their grammatical form mirrors their logical form. Some conjunctions of two tensed statements conventionally imply that the first-mentioned statement describes a situation that occurred before the second one; this implication needs to be made explicit before the standard rules of inference for conjunctions can be applied. Similarly, some conditionals imply by their content that the antecedent if true would describe a situation temporally prior to that described in the consequent; as with conjunctions, this implication needs to be made explicit before the standard rules of inference for conditionals can be applied. And so on.

Apart from the need for some regimentation of natural-language sentences into a "canonical notation" (Quine 1960, Chap. 5) before applying a criterion for formal deductive validity, the substitutional conception advanced in that first article suffers from the difficulty that a language may not have the resources to express the counterexample to a form of inference that is in fact invalid. This defect can be remedied by permitting extensions of the language that allow for such expression, but the substitutional conception faces a further difficulty when one extends it, as

that first article did, to cover what that article called 'enthymematic validity' as well as formal deductive validity. With purely formal structures, if we allow for variation of our universe of discourse, we can take the mere factual absence of a counterexample as indicating that there *cannot* be such a counterexample (Sher 1996). With structures that are only partly formal, the mere factual absence of a counterexample is not enough to guarantee the required necessity. Consider for example the Napoleon argument mentioned in my paper "Inference claims" (Hitchcock 2011, Chap. 8 of the present volume):

(1) Napoleon ruled France, and was exiled to Elba, so he was short.

Since no substitution on the name 'Napoleon' produces a parallel argument with true premisses and a false conclusion, then on the substitutional conception of enthymematic validity the above argument is enthymematically valid. But clearly it is not. The conclusion does not follow from the premisses, because it is a mere coincidence that the one individual who ruled France and was exiled to Elba was short. To be a legitimate inference, it should hold for merely possible cases, such as the hypothetical scenario in which another former ruler of France, say Jacques Chirac, was exiled to Elba. But it does not: Jacques Chirac was not short. The solution to this problem, worked out in (Hitchcock 2011), was to require for enthymematic validity that an inference-licensing covering generalization be not only true but necessarily true.

The phenomenological appeal in that first article to our own experience when we reason enthymematically for ourselves is an extremely strong argument against the claim, common for example to Aristotle (1959, *Rhetoric* I 2 1357a17–19) and to Quine (1972, p. 169), that authors of enthymemes leave unstated a premiss that they have in mind. Quite typically, we ourselves have no such premiss in mind when we reason to ourselves, as we can verify by immediate retrospection when we catch ourselves drawing a conclusion mentally and notice that the reasoning is enthymematic. Since we are not leaving unstated a premiss we have in mind when we reason enthymematically to ourselves, there is no reason to suppose that we have it in mind when we argue enthymematically to others.

An important discovery reported in that article is that enthymemes that can be made formally deductively valid by the addition of a singular statement are no exception to the article's universal generalization thesis, since every singular statement that attributes a property F to an individual x is logically equivalent to a second-order universal generalization: that every property that belongs to every individual with property F belong to individual x. (That is: if every F is G, then x is G.) It is debatable, however, whether this fact rescues such arguments from the traditional approach of postulating an implicit gap-filling premiss. For in general singular statements are only contingently true, and a contingently true covering generalization seems insufficient to license an inference. If it were sufficient, then it would follow from the information that Napoleon ruled France and was exiled to Elba that he was short, in view of the contingently true covering generalization that every ruler of France who was exiled to Elba was short. As to the contingency of

singular statements, the assumption used in the article as an example, that Depo-Provera has been approved at all levels of the drug testing procedure in the United States, is only contingently true if it is true. If one requires an inference-licensing covering generalization to be a necessary truth, then one is led to the hybrid approach to enthymemes advocated by Freeman (2011, pp. 186–189), according to which enthymematic inferences are to be evaluated directly if they have a non-contingent universal covering generalization but otherwise by postulating a gap-filling implicit premiss.

A reassuring discovery reported in that initial article is that its universal generalization thesis implies the same attribution of an implicit assumption to incomplete Aristotelian categorical syllogisms as does the logical tradition. This coincidence of results is a problem for theorists like Gerlofs (2009), Lilian Bermejo-Luque (2011) and Michael Hoffmann (2011) who would take as the implicit inference-licensing assumption of any argument its ungeneralized associated material conditional. The ungeneralized associated material conditional of an incomplete Aristotelian categorical syllogism is always weaker than the assumption that the logical tradition would attribute to it. Consider for instance the argument that, since they are mammals, then whales suckle their young. The logical tradition would attribute to this argument the gap-filling assumption that mammals suckle their young. But the ungeneralized associated material conditional, that whales suckle their young if they are mammals, makes a logically weaker claim, which could be true even if not all mammals suckle their young. Only the assumption that all arguments are implicitly general vindicates the treatment of incomplete Aristotelian categorical syllogisms in the logical tradition.

That first article provided useful guidelines for resolving indeterminacies when articulating an argument's implicit inference-licensing assumption. In particular, Freeman (2015) has used them to develop a procedure for identifying the Toulminian "warrant" of an argument—i.e. the implicit covering generalization that licenses the inference from premiss(es) to conclusion. He brings to bear a rather forbidding lexicon of logical symbols for analyzing ordinary language arguments. He plans to make his procedure part of a projected book on connection adequacy, a book that would complement his previous books on premiss adequacy (Freeman 2005) and argument structure (Freeman 2011).

The final section of "Enthymematic arguments" gives examples of other reasons than evaluating its inference for supplying an implicit, supposedly gap-filling assumption for an enthymeme: to understand why the author drew the conclusion, to strengthen an apparently weak argument, to seek support for one's own position, to discredit the argument. Although subsequent articles collected in the present part did not allude to those other purposes, they are clearly legitimate. If one has such a purpose in mind, then making the argument's implicit assumption explicit is reasonable and even necessary. The assumption that one identifies may turn out to be a covering generalization, or something stronger that provides support for a covering generalization, or merely the most plausible inference license that one can think of.

10.2 "Does the Traditional Treatment of Enthymemes Rest on a Mistake?" (1998)

Although its publication date is 13 years later than the publication date of the first article in this part, the second article was in fact prepared only eight years later, in 1994, for the Third International Conference on Argumentation in Amsterdam.[2] Its purpose was to draw further scholarly attention to the conception of enthymematic validity proposed in the earlier article, with the help of what I hoped would be an arresting title, parallel to that of Harold Pritchard's classic paper "Does moral philosophy rest on a mistake?" (Pritchard 1912d)—whose title I had misremembered as including the word 'traditional'. The main new contributions of the article were to explore model-theoretic and formal alternatives to the substitutional conception articulated in the first article, and to acknowledge the partial truth of the traditional treatment of enthymemes, that sometimes they are advanced in a context where assumptions are taken as commonly understood but need to be spelled out before determining whether the conclusion follows. Such assumptions are not inference-licensing covering generalizations but implicit restrictions of the universe of discourse over which the variables in a covering generalization are permitted to range.

The chapter mentions the terminological problem of claiming that enthymemes generally do not have unstated premisses when the tradition takes the word 'enthymeme' to mean an argument with an unstated premiss (or, sometimes, an unstated conclusion). The power of this tradition is such that I eventually shifted from using the expression 'enthymematic validity' for a type of validity that depended on a substantive principle. Instead, I came to use the expressions 'material validity' and 'material consequence', thus linking to other contemporary treatments of the relation by Sellars (1953), Kapitan (1982), Robert Brandom (1988, 1994, 2000) and Read (1994). The expression 'material consequence' carries its own risk of misunderstanding, through a false assimilation to the concept of so-called 'material implication' stemming from the medieval *consequentia materialis* (Dutilh Novaes 2012)—a relation that is no implication at all, but a 'conditionality' that consists merely in its not being the case that the antecedent is true and the consequent false. In contrast to this misnamed 'material implication', the contemporary concept of material consequence involves a genuine relation of *implicans* to *implicatum*.

To the five contemporary conceptions of logical consequence described in Sect. 5.2 of the article should be added the information-theoretic conception put forward by Corcoran (1989, p. 30; 1998). According to this conception, a proposition follows from a set of propositions if and only if the information contained in the proposition is contained within the set (Corcoran 1998, p. 115). Corcoran contrasts the information-theoretic approach to logic with what he calls "transformation-theoretic" approaches (p. 114) that analyze validity in terms of

[2] As mentioned in note 1, the first article was written in 1986. Its publication date of 1985 is due to the late appearance of issues of the journal in which it was published.

transformations that map one argument to another. Corcoran would classify four of the five conceptions of logical consequence described in Sect. 5.2 as transformation-theoretic: the modal, substitutional, formal and model-theoretic conceptions. The informational conception can be extended to some but not all cases of enthymematic or material consequence, namely to those cases where the ruling out of true premisses and a false conclusion is due to the meaning of non-logical terms. It is a nice question when such ruling out is due to meaning and when it is due to substantive matters of fact. We have discovered that water is a compound whose molecules each consist of two atoms of hydrogen and one atom of oxygen. Is it then part of the meaning of the word 'water' that the substance that it names contains oxygen? Or is it a necessary feature of the universe rather than a matter of semantics that water contains oxygen? If it is part of the meaning of 'water', then the proposition that the liquid in a particular glass is water contains the information that the liquid contains oxygen. If it is a necessary feature of the universe, then the proposition in question does not contain the information that the liquid contains oxygen. Sellars (1953) claimed that all such necessary truths were truths of meaning, and in this respect was followed by his student Robert Brandom in his inferentialist semantics (Brandom 1994, 2000). But there seems to be a difference in status between necessary truths like the chemical composition of water that came to be known as a result of empirical investigation and necessary truths like the non-existence of unmarried bachelors that can be determined to be true without any empirical investigation at all. If truths of the former sort are factual rather than semantic necessities, then the information-theoretic conception of consequence will not capture all enthymematic or material consequences.

The claim in Sect. 5.2.5 of the article that Tarski originated the contemporary model-theoretic conception of logical consequence needs some qualification, as indicated in my introduction to the exact translation, by Magda Stroińska and myself, of Tarski's classic paper (Tarski 2002). Whereas the contemporary model-theoretic conception is typically applied to formal languages in which the extra-logical constants are uninterpreted, Tarski worked with "formalized" languages in which the extra-logical constants were interpreted. Further, whereas it is essential to the contemporary model-theoretic conception that variation be allowed not only in the interpretation assigned to extra-logical constants but also in the size (cardinality) of the domain over which individual variables range, Tarski worked with a fixed domain. Tarski's paper is thus the ancestor of the contemporary model-theoretic conception rather than the first instance of its formulation.

In Sect. 5.3, an unstated part of my motivation for revising the standard conceptions of logical consequence so as to exclude trivial cases was to avoid an overly permissive conception of enthymematic consequence that would count any inference as good where the conclusion was true or a premiss was false. Without the removal of trivial cases from the extension of logical consequence, such arguments as the following would turn out to have a good inference:

(2) Pythagoras was a mathematician, so ice cream was invented in Italy.

Since the conclusion is true, then if one takes some content expression in the premiss as the only content expression subject to variation (by substitution, re-interpretation, or replacement by a variable) the argument would meet the condition that no uniform variation on a specified set of content expressions (by substitution, re-interpretation, or taking another instance of the form) has a true premiss and a false conclusion. Only the requirement that some variation on the specified set of content expressions produces an argument with a false conclusion prevents the conclusion of argument (2) from being an enthymematic consequence of its premiss. The same point can be made about any other argument with a true conclusion.

A parallel claim can be made about any argument with a false premiss, such as the argument:

(3) Water is an element, so the Earth is flat.

Since water is not in fact an element but a compound, there is no variation of any set of content expressions in the conclusion on which the premiss is true and the conclusion false. Only the requirement that some variation on the specified set of content expressions produces an argument with a true premiss prevents the conclusion of argument (3) from being an enthymematic consequence of its premiss. The same point can be made about any other argument with a false premiss.

Fortunately, the rejection of *ex falso quodlibet* (from a [logical] falsehood anything follows) and of *e quolibet verum* (from anything there follows any [logical] truth) has independent motivation, these forms of reasoning having attracted suspicion for centuries as being intuitively invalid. Recently Tennant has shown that one can have a "core logic" that is completely adequate as an underlying logic for science and mathematics without accepting either of these principles (Tennant 2017).

At the end of Sect. 5.4, I raised a number of questions about the generic conception of consequence elaborated in that article: that there is some general feature of the argument which is incompatible with the argument's having true premisses and a false conclusion, even though that feature is compatible with the argument's having true premisses and compatible with the argument's having a false conclusion.

What specific conceptions of consequence result if we give the generic conception a substitutional, formal or model-theoretic specification? According to the substitutional conception, there is a set of one or more content expressions in the argument's premisses and conclusion such that at least one uniform substitution on each of them within a specified range produces an argument with true premisses, at least one an argument with a false conclusion, but none an argument with both true premisses and a false conclusion. According to the formal conception, the argument is an instance of a form of argument that has at least one instance within a specified range with true premisses, at least one such instance with a false conclusion, but no such instance with true premisses and a false conclusion. According to the

model-theoretic interpretation, there is a set of content expressions in the argument for which there is a re-interpretation within specified limits on which the premisses are true, such a re-interpretation on which the conclusion is false, but no re-interpretation on which the premisses are true and the conclusion false.

What are the differences in extension, if any, between these different specifications? As far as I can see, the formal and the substitutional conceptions have the same extension. We can see this by deducing satisfaction of each conception from satisfaction of the other. If an argument satisfies the formal conception, then it has an instance of its valid form that has true premisses and an instance that has a false conclusion, but no instance with both true premisses and a false conclusion. These conditions amount to there being a set of content expressions (those that are values of the variables in the valid form) on which there is at least one uniform substitution within a specified range that has true premisses and at least one that has a false conclusion, but none that has both true premisses and a false conclusion. By similar reasoning, if an argument satisfies the substitutional conception, it also satisfies the formal conception. The model-theoretic conception has a different extension, since there may be arguments where limitations of the language prevent one or more of the conditions in the substitutional and formal conceptions from being realized. For simplicity, suppose that the issue is whether a conclusion is a consequence of a set of premisses with respect to a specified set of content expressions, each of which is allowed to vary within a specified range (where the variation consists respectively in uniform substitution, instantiation of variables in a form, or re-interpretation). There may be no substitution or instance where all the premisses are true, even though there is a re-interpretation on which they are all true—one for which language lacks expressive means. Similarly, there may be no substitution or instance where the conclusion is false, even though there is a re-interpretation on which it is false. And there may be no substitution or instance where the premisses are true and the conclusion false, even though there is a re-interpretation on which the premisses are true and the conclusion false. In the first and second cases, the conclusion is not a consequence of the premisses on the substitutional or formal specifications but is a consequence of them on the model-theoretic conception if the other two clauses are satisfied. In the third case, the conclusion is a consequence of the premisses on the substitutional or formal specification if the other two clauses are satisfied but is not a consequence of the premisses on the model-theoretic conception. Thus there is partial overlap between the substitutional and formal conceptions on the one hand and the model-theoretic specification on the other hand. Assuming a language with the expressive power of most natural languages, however, the overlap would be massive. There would be rare cases, perhaps involving talk of non-denumerably infinite sets like the set of real numbers (for which no language has a complete set of names), where the verdict on the model-theoretic conception would differ from that on the other two conceptions.

How closely do the different specifications fit our intuitive judgments of when a conclusion is a consequence of stated premisses? Here subsequent reflection, encapsulated in the Napoleon argument in my article "Inference claims"

(Hitchcock 2011), reprinted as Chap. 8 in the present work, has uncovered a fatal discrepancy. Consider the argument mentioned a few paragraphs back:

(1) Napoleon ruled France and Napoleon was exiled to Elba, so Napoleon was short.

This argument satisfies all three variants of the generic conception of consequence with respect to the name 'Napoleon'. For example, the premisses are true if 'Napoleon' is given its usual interpretation and the conclusion is false if 'Napoleon' is taken to name Jacques Chirac, but there is no interpretation on which the premisses are true and the conclusion false: on the sole interpretation of the name 'Napoleon' on which the premisses are true, the conclusion is also true. But the conclusion obviously does not follow. It is a mere coincidence that the person who ruled France and was exiled to Elba was short. One cannot reasonably infer Napoleon's shortness from these two facts of his biography. One can multiply counterexamples of this sort. They have in common that satisfaction of the requirements for the generic consequence relation is merely accidental. In particular, the generic relation is satisfied whenever a property belonging to some individual or kind is inferred from some other property unique to that individual or kind, even when there is no connection between the two properties. An example is the argument:

(4) Empire apples are a hybrid of Red Delicious apples and Macintosh apples. So they are often available in the supermarket.

In this conflict between a plausible general principle and intuitions about particular cases, the only reasonable course is to go with the intuitions. The generic conception advanced in Chap. 5 needs to be strengthened so as require satisfaction of its conditions to be necessary rather than merely accidental. The way to do so is to shift the focus from its conditions to the status of the covering generalization that expresses satisfaction of the third condition. It must be necessary in the sense of supporting counterfactual instances. The covering generalization of argument (1) about Napoleon, that all former rulers of France who were exiled to Elba were short, does not support counterfactual instances; if Jacques Chirac, the former president of France, had been exiled to Elba, he would not be short. The requirement that an inference-licensing covering generalization be not only true but necessary rules out cases where the generalization is true merely because as a matter of contingent fact either not all the premisses are true or the conclusion is false.

The qualification of the third requirement changes the motivation for the other two requirements, which amount to holding that the necessarily true covering generalization has both an instance with a true antecedent and an instance with a false consequent. But what if it is merely an accidental fact that one of these requirements is not met? Would it be enough that it *could* have an instance with a true antecedent? Consider the argument:

(5) Burj Khalifa is 850 m tall. So it is taller than the Empire State Building.

Let us suppose that it is a matter of physical necessity, given the (fixed) height of the Empire State Building,[3] that any building 850 m tall is taller than the Empire State Building. In that case the third condition of the strengthened conception of consequence is met. However, at least at the time of writing, no building on Earth is 850 m tall. (Burj Khalifa, at the time of writing the tallest building on Earth, is 829.8 m tall.) So the first condition is not met. But there *could* be a building 850 m tall. The necessary truth of the covering generalization is thus not trivial; it does not depend on the impossibility of its having a true antecedent. Thus there seems reason to relax the first requirement to a requirement of possible truth of an analogue of the premisses. A similar point can be made about the second requirement, that the necessarily true generalization has an instance with a false consequent. Consider the following argument:

(6) Burj Khalifa is less than twice the height of the Empire State Building. So it is less than 886 m tall.

Here the covering generalization that any building that is less than twice the height of the Empire State Building is less than 886 m tall can be regarded as necessarily true.[4] As a matter of contingent fact, it has no instance with a false consequent. But there *could* be such an instance; there could be a building that is not less than 886 m tall. This possibility saves the covering generalization from being a necessary truth as a result solely of its being unable to have a false consequent. And that seems enough. The conclusion of (6) follows from its premiss.

We are thus led by these reflections to a modal variant of the generic conception of consequence advanced in the article, "Does the traditional treatment of enthymemes rest on a mistake?" This variant would read as follows:

> There is some general feature of the argument which is necessarily incompatible with the argument's having true premisses and a false conclusion, even though that feature is compatible with the argument's possibly having true premisses and compatible with the argument's possibly having a false conclusion.

A bolder revision would do away altogether with the two additional requirements, taking it as sufficient that a covering generalization is necessarily true. If one is willing to accept as valid the principles *ex falso quodlibet* (from a contradiction, anything follows) and *verum ex quolibet* (a [logical] truth follows from anything), then (arguably) one should be willing to accept its extension to cases where the

[3]Strictly speaking, a contingently true assumption about the height of the Empire State Building needs to be supplied as a missing premiss. The Empire State Building is 443 m tall. It could be taken as shared background knowledge that it is less than, say, 600 m tall.

[4]Strictly speaking, one should add as an unstated premiss the contingently true information that the Empire State Building is 443 m tall. The necessarily true inference-licensing covering generalization would then be that any building that is less than twice the height of a building that is 443 m tall is less than 886 m tall. That generalization is true as a matter of arithmetical necessity.

falsehood of at least one premiss or the truth of the conclusion is a matter of necessity. Consider for example the argument:

(7) The human being known as Jesus of Nazareth will never die. So pigs have wings.

If it is a (physically) necessary truth that every human being is mortal, then the argument has a necessarily true covering generalization: All animals have wings if Jesus will never die. So without the first exclusionary clause in the generic conception of consequence, the conclusion of (5) would follow from its premiss. Similarly with the argument:

(8) Pigs have wings, so Jesus is mortal.

On the same assumption that the conclusion is necessarily true, this argument has a necessarily true covering generalization: If some animals have wings, then Jesus is mortal.[5] So without the second exclusionary clause in the generic conception of consequence, the conclusion of (8) would follow from its premiss. (If one thinks that it is not a matter of necessity that every human being is mortal, a similar pair of counter-intuitive examples could be constructed using some other truth that is non-logically necessary, such as a necessary truth of arithmetic or physics.) If one wishes to hold that the conclusions of arguments (7) and (8) do not follow from their premisses, then one should also reject the principles *ex falso quodlibet* (from a contradiction, anything follows) and *verum ex quolibet* (a [logical] truth follows from anything), Fortunately there is a logic that rejects them but is adequate as an underlying logic for all mathematical and scientific theories (Tennant 2017).

How closely does the covering generalization generated by this conception of consequence correspond to the implicit supposedly gap-filling assumption which we intuitively supply for the enthymemes we encounter? In some cases, particularly where there is no apparent topical overlap between premiss(es) and conclusion, we might intuitively supply as a gap-filler the argument's ungeneralized associated conditional rather than a generalization of it. For example, a believer in unstated gap-filling premisses might supply as the gap-filler for (7) the assumption that, if Jesus will never die, then pigs have wings. Since this conditional has an obviously false consequent, it would be read as a picturesque way of denying its antecedent, and the argument would then be found wanting on the ground that its implicit assumption contradicts its explicit premiss. If the argument is dialectical, with the conclusion drawn from someone else's claim, then the supposed gap-filling assumption would amount to assuming that the interlocutor's claim is false, and thus would have no probative value. It would merely register disagreement. Similarly, a believer in unstated gap-filling premisses might supply as the gap-filler for (8) the assumption that, if pigs have wings, then Jesus is mortal. This conditional has an obviously false antecedent, and if construed as a material conditional

[5]The generalization is: for all animals x, if xes have wings, then Jesus is mortal. This generalization is logically equivalent to the version above, whose meaning is easier to understand.

is therefore true. Further, there seems no other basis for judging its truth-value. Thus the gap-filling approach ends up charging the argument with inconsistent premisses, in that the supposed truth of the minimal gap-filler implies the falsity of the stated premiss. The reader is invited to explore other examples where a proponent of the gap-filling approach would supply the argument's ungeneralized associated material conditional as the implicit gap-filling assumption rather than a covering generalization.

Recently, some authors (Gerlofs 2009, pp. 81–120; Bermejo-Luque 2011, pp. 62–64; Hoffmann 2011) have proposed a uniform approach of attributing to all arguments the assumption of their associated material conditional, an assumption that Gerlofs calls a "connecting premise", Bermejo-Luque an "inference-claim", and Hoffmann an "enabler". This approach is safe, since anyone who infers a conclusion from a set of premisses is committed to the associated material conditional, since denial of an argument's associated material conditional is logically equivalent to asserting the premisses and denying the conclusion. The approach can even accommodate inferences whose conclusion is qualified by hedging terms like 'probably' or 'presumably', since those terms will qualify the consequent of the associated material conditional. Further, someone who is asserting the antecedent of a material conditional as a basis for inferring its consequent cannot defend their assertion of the conditional by claiming that its antecedent is false or by claiming that its consequent is true, since in the first case they would contradict themselves and in the second place they would be assuming the truth of what they are trying to prove. Thus pragmatic considerations preclude use of the paradoxes of material implication to justify an argument's associated material conditional. I conjecture that, with this constraint, the only way to justify such a conditional is to appeal to some generalization of it or to a set of premisses that collectively entail a generalization of it. Some years ago Lilian Bermejo-Luque made several attempts in e-mail correspondence to find a counterexample to this conjecture, but was unsuccessful. So, although I have no proof of this conjecture, it remains a live possibility. If it is correct, then the approach of treating an argument's inference-license as its associated material conditional amounts pragmatically to the same thing as the requirement for good inference that the argument have a true covering generalization. Admittedly, there is no requirement that the generalization be necessarily true, and to that extent the identification of an argument's "connecting premise" or "inference claim" or "enabler" with its associated material conditional differs from the just-elaborated modally strengthened generic conception of consequence.

Where the theory differs from our intuitions, which gives a better judgment? In the cases just described, where absence of topical relevance of premiss(es) to conclusion might lead us to postulate an ungeneralized associated material conditional as an argument's implicit assumption, there seems little to choose between that intuitive response and the theoretical approach of broadening the concept of logical consequence to include enthymematic consequence. The intuitive response just takes a more roundabout route to end up with the same judgment as theory implies: that the argument is a non sequitur.

Where our intuitions give a better judgment, can we revise our conception to accommodate them in ways that are not totally ad hoc? This revision has turned out to be necessary for cases where a true covering generalization is true merely accidentally. The conception of enthymematic consequence articulated in the chapter under discussion needs to be modally strengthened in one respect so as to require that the covering generalization be necessarily true. Correspondingly, the exclusion of trivial cases needs to be relaxed so as to require only a possible parallel with true premiss(es) and a possible parallel with a false conclusion, not necessarily actual parallels of those two sorts.

What structural rules of consequence apply to this generic conception of consequence and to its various specifications? Structural rules of consequence are rules that are independent of the content of the sentences or propositions among which the consequence relation obtains, including the logical content. Classical logical consequence conforms to at least five such structural rules, identified by Gerhard Gentzen in his classic paper on logical deduction (Gentzen 1969/1935): reflexivity, cut, weakening, contraction, permutation. I explain these five rules in the following paragraphs, which for the sake of contemporary relevance deal with the modally strengthened relation, in which there is some general feature of the implying sentences and the implied sentence which rules out as a matter of necessity that the implying sentences are true and the implied sentence false, even though this general feature leaves open the possibility that the implying sentences are true and leaves open the possibility that the implied sentence is false. Considerations of space and time permit only a brief discussion of whether this modally strengthened relation obeys the mentioned rules. For simplicity, the discussion will be confined to the formal specification of the modally strengthened conception.

Reflexivity is the property that every sentence is a consequence of itself. The modally strengthened version of enthymematic or material consequence clearly has this property, since the form of argument 'p, so p' cannot have an instance with a true premiss and a false conclusion but can have an instance with a true premiss and can have an instance with a false conclusion.

Cut is a property that permits one to chain together two arguments in which the conclusion of one is a premiss of the other. A consequence relation has this property if and only if a conclusion c is a consequence of the union of two sets of premisses when it is a consequence of the combination of one of the sets with a sentence that is a consequence of the other set. In symbols: c is a consequence of $\Gamma \cup \Delta$ (the union of the sets Γ and Δ) if there is a sentence p such that p is a consequence of Γ and c is a consequence of $\Delta \cup \{p\}$. A limiting case of cut, where Γ is a singleton set $\{q\}$ and Δ is empty, is the property of *transitivity*: c is a consequence of $\{q\}$ if there is a sentence p such that p is a consequence of $\{q\}$ and c is a consequence of $\{p\}$. The formal version of the modally strengthened relation of enthymematic or material consequence has neither of these properties, except in restricted versions. To construct counterexamples, it suffices to take two single-premiss arguments in which the premiss of one is the conclusion of the other and the consequence relation holds in one case only when one takes one content expression in the shared sentence as variable but in the other case only when one takes another content

expression in the shared sentence as variable. Such counterexamples are difficult to invent, which is perhaps an indication of their rarity. An instance of such a counterexample might be the following chain of reasoning:

(9) Whales suckle their young, so whales are mammals, so orcas are mammals.

Here the first inference is valid in virtue of the principle that every animal that suckles its young is a mammal, which one gets as the covering generalization when one takes 'whale' as the only variable content expression. Forms of argument that one gets when one takes some other set of content expressions as variable are not valid; for example, the form of argument 'Ks have property F, so Ks are mammals' has instances with a true premiss and a false conclusion, such as the argument 'Ants live in colonies, so ants are mammals'. The second inference is valid in virtue of the principle that orcas are whales, which one gets as the covering generalization when one takes 'mammal' as the only variable content expression. Forms of argument that one gets when one takes some other set of content expressions as variable are not valid; for example, the form of argument 'Ks are Ls, so orcas are Ls' has instances with a true premiss and a false conclusion, such as the argument 'Ants are insects, so orcas are insects'. But the inference from the ultimate premiss that whales suckle their young to the ultimate conclusion that orcas are mammals is of dubious validity. There is no content expression shared by the premiss and the conclusion which one can treat as variable and so as the basis for a covering generalization.

Material consequence does however conform to a restricted cut rule. If the conclusion of one argument is a premiss of another and the consequence relation holds in each of them in virtue of the same set of content expressions treated as variable, then the consequence relation holds between (a) the union of the two sets of premisses with the conclusion of the first argument omitted and (b) the conclusion of the second argument. In symbols, c is a consequence of $\Gamma \cup \Delta$ if there is a sentence p such that p is a consequence of Γ and c is a consequence of $\Delta \cup \{p\}$, in each case with the same set of content expressions treated as variable. The proof of this result is too complex for the present context, but a sense of why it is true can be gotten by seeing how it is true of some particular chain of reasoning with a constant set of variable content expressions. Consider for example the following argument:

(10) Whales are mammals, so whales suckle their young, so whales provide care for their newborns.

Here each of the two inferences is valid in virtue of necessarily true covering generalizations that one constructs by treating the same content expression 'whale' as variable: mammals suckle their young, and animals that suckle their young provide care for their newborns. (The supplementary conditions that the form of argument can have an instance with a true premiss and can have an instance with a false conclusion are also satisfied in each case if one constructs the form by replacing 'whale' by a variable of an appropriate sort; in particular, some animals do not suckle their young and some animals do not provide care for their

newborns.) And as a result the inference from the ultimate premiss to the ultimate conclusion is valid: from the premiss that whales are mammals, it follows that they care for their newborns. The supplementary conditions are already provided for by being met for the first and second inferences in argument (10). And the main condition for material consequence is met as a consequence of its being met for each of the two inferences: If it is necessarily true that mammals suckle their young and necessarily true that animals that suckle their young provide care for their newborns, then each of the embedded propositions is actually true and, by hypothetical syllogism, so is the proposition that mammals suckle their young. But this proposition must be necessarily true, since it is a logical consequence of necessarily true premisses. Parallel reasoning will show that transitivity applies in all such cases, and analogous but more complex reasoning will show that the cut rule applies in this restricted version.

Weakening (also called 'thinning' and 'monotonicity') is the principle that the consequence relation continues to hold if the implying sentences are supplemented. In symbols, if c is a consequence of a set Γ, then c is a consequence of $\Gamma \cup \{p\}$. The modally strengthened material consequence relation does not satisfy this condition. Indeed, even the logical consequence relation of which it is an extension does not satisfy this condition. If the added sentence p is inconsistent with the original set Γ, then the condition that there could be a parallel instance with true premisses may not be met. Consider for example a simple *modus tollens* argument:

(11) It is not cloudy. If it is raining, it is cloudy. So it is not raining.

The conclusion of this argument is a logical consequence of its premisses, in virtue of the form of argument 'not q; if p, then q; so not p' of which it is an instance. An argument of this form cannot have true premisses and a false conclusion, even though it can have true premisses and can have a false conclusion. But suppose one adds the contradictory of the first premiss as an extra piece of information:

(12) It is not cloudy. If it is raining, it is cloudy. But it is cloudy. So it is not raining.

Now the argument has no form that satisfies all three conditions of the modally strengthened consequence relation. If one treats 'it is cloudy' as a variable content expression, then the resulting form 'not q; if p, then q; q; so not p' can have no instance with its premisses all true. If one keeps 'it is cloudy' fixed, then the form resulting from treating 'it is raining' as variable ('it is not cloudy; if p, then it is cloudy; it is cloudy; so not p') likewise cannot have an instance with its premisses all true.

As with cut, however, the modally strengthened material consequence relation satisfies a restricted form of the weakening rule. The consequence relation continues to hold if the implying sentences are supplemented by a sentence that is consistent with them. In fact, even consistency is not required for maintenance of the consequence relation. What is required, and sufficient, is that the supplemented pair has a form that satisfies the three conditions of the modally strengthened consequence relation. Consider for example the following *modus ponens* argument:

(13) It is raining. If it is raining, it is cloudy. So it is cloudy.

Suppose one makes the set of premisses inconsistent by adding the information that it is not raining:

(14) It is raining. If it is raining, it is cloudy. But it is not raining. So it is cloudy.

The conclusion still follows, because the argument has the form 'p; if p then q; but r; so p'. This form satisfies all three conditions of the modally strengthened consequence relation: it cannot have an instance with true premisses and a false conclusion, even though it can have an instance with true premisses and can have an instance with a false conclusion.

Contraction is the property of a consequence relation that a duplicate among the implying sentences can be deleted without destroying the consequence relation. In symbols, if c is a consequence of $\Gamma \cup \{p\} \cup \{p\}$, then it is a consequence of $\Gamma \cup \{p\}$. Since the consequence relation has been defined as a relation between a set and a sentence, and the identity of a set remains the same if a duplicate in the list of its members is removed, the consequence relation as defined obeys the rule of contraction.

Permutation is the property that the consequence relation is preserved if the order in which the implying sentences are mentioned is changed. As with contraction, this property quite obviously belongs to the modally strengthened version of the consequence relation. Two sets are identical if the lists of their members differ only in the order in which the members are mentioned.

What objections can be raised to the revised generic conception of consequence, and what replies to those objections are possible? This question has been addressed in the preceding discussion.

What formal systems incorporate a given specification of the revised generic conception of consequence? Answering this question would take us too far afield from the present reflection. I record here my impression that Neil Tennant's "core logic" (Tennant 2017) probably fits the modally strengthened formal version of logical consequence. Other forms of relevant logic do not, because they typically reject disjunctive syllogism (p or q; not p; so q), whereas arguments of this form are clearly valid on the modally strengthened formal version of logical consequence: there cannot be an instance of the form with true premisses and a false conclusion, even though there can be an instance with true premisses and there can be an instance with a false conclusion.

10.3 "Toulmin's Warrants" (2003)

"Toulmin's warrants" is a revised version of a paper presented at the Fifth International Conference on Argumentation in Amsterdam in 2002. It develops the argument of Sect. 5.4.3 of my article "Does the traditional treatment of

enthymemes rest on a mistake?" (Hitchcock 1998, Chap. 5 of the present volume) that Toulmin's warrants are general rules of inference, not implicit premisses. The 2002 conference paper clarified Toulmin's concept of a warrant and considered objections that had been raised to his distinction between data or grounds on the one hand and warrants on the other. It did so as an indirect way of reinforcing my own claim in the earlier article that the implicit assumptions attributed to arguments as "gap-fillers" are generally not filling a gap, but are articulating a substantive rule of inference that the analyst attributes to the argument. I have seen no reason since publication of the revised conference paper to change any of its interpretations or responses to objections.

Subsequently I collaborated with Bart Verheij in soliciting new articles on the Toulmin model for the analysis of arguments, of which some were published in a special issue of the journal *Argumentation* (vol. 19, no. 3, 2005) and a larger selection as a book (Hitchcock and Verheij 2006). I also co-organized a conference at McMaster University in May 2005 on the topic of the uses of argument, which was meant to be in part a reference to the title of Toulmin's influential book (Toulmin 1958). Toulmin's keynote speech at that conference appeared in print after its oral delivery, despite its stated publication date (Toulmin 2004).

10.4 "Non-logical Consequence" (2009)

"Non-logical consequence" was written in 2008 for a special issue on informal logic and argumentation theory of the Polish journal *Studies in Logic, Grammar and Rhetoric*. It seemed appropriate to connect my previously articulated ideas on enthymematic consequence with the work of the famous Polish logician Tarski, not only because the article was to be published in a Polish journal, but also because I had co-authored a translation from Polish of Tarski's classic 1936 article on the concept of logical consequence, to which I had written an introduction. In that article, Tarski noted that the concept of logical consequence was relative to a choice of which terms in a language to treat as logical. He even entertained the possibility of treating all terms in a language as logical, and claimed (controversially and falsely) that doing so would reduce logical consequence to so-called material implication. This relativity made it possible for me to enlist Tarski as a perhaps unwitting ally, since enthymematic consequence is the relation that results when some but not all the non-logical terms in the relation are treated as if they were logical.

In the article I addressed for the first time in print the difficulty raised by Pinto (2006) of taking merely contingent universal generalizations to license inferences. On the one hand, it seemed that the contingent generalization that all presidents of the United States to that date had been men would license the inference in the following argument:

(15) Abraham Lincoln was a president of the United States. So Abraham Lincoln was a man.

On the other hand, if one took the mere contingent truth of any universal generalization to be enough for it to license an inference, then one ended up counter-intuitively with regarding as having a valid inference an argument like the following:

(16) Napoleon ruled France. Napoleon was born in Corsica. So Napoleon was exiled to Elba.

The article concluded with an unanswered challenge to find a principled intermediate position between a very broad consequence relation groundable in merely contingent true covering generalizations and a somewhat narrower consequence relation that requires an inference-licensing covering generalization to be true as a matter of necessity. This intermediate position, if it could be found, would imply that the conclusion of (15) follows from its premiss but the conclusion of (16) did not. The last two articles in the present part of this collection wrestled with this challenge.

10.5 "Inference Claims" (2011)

"Inference claims" is based on a keynote address to the 9th conference of the Ontario Society for the Study of Argumentation (OSSA), held in Windsor, Ontario in May 2011. With permission for dual publication, the paper was published both in the journal *Informal Logic* and in the proceedings of a conference held in Coimbra, Portugal, where an earlier version had been presented.

I took the occasion of these conferences to develop the intermediate position for which I had expressed a hope in the 2009 paper on non-logical consequence. The intermediate position was to require that inference-licensing covering generalizations be not only true (or otherwise acceptable) but also capable of supporting counterfactual instances. As it turned out, neither argument (15) nor argument (16) in the preceding paragraph met this requirement. The generalization that all past presidents of the United States were men would not hold for the counterfactual situation in which Walter Mondale was elected president in 1984 and after dying in office was succeeded by his running mate Geraldine Ferraro. And the generalization that past rulers of France born in Corsica were exiled to Elba would not hold for the counterfactual situation in which Giscard D'Estaing was born in Corsica and exiled to Elba. But other merely contingent generalizations, like the generalization that all those who live in the (US) White House live in Washington, do support counterfactual instances. If Mitt Romney had been elected president of the United States in 2012 and thus came to live in the White House, he would live in Washington. Contingent but counterfactual-supporting generalizations of this sort can however

license inferences only over an unspecified time interval including the present, since for example either the physical location of the White House or the boundaries of the city of Washington could change in the future (and might have been different in the past). At the OSSA conference, my contention that Vladimir Putin would live in Washington if he lived in the (US) White House elicited the vigorous objection that it was unknowable where the (US) White House would be if the unlikely situation arose in which the president of Russia lived in the (US) White House; perhaps he would have relocated the official residence of the president of the United States to Moscow. This challenge led to the last paper included in the present part of the present volume, in which I explored various theories of the truth-conditions for counterfactual statements.

"Inference claims" contains my most recent published statement of my conception of inferential support. It is therefore worth quoting it here, for the record:

> A conclusion follows from given premisses if and only if an acceptable counterfactual-supporting generalization rules out, either definitively or with some modal qualification, simultaneous acceptability of the premisses and non-acceptability of the conclusion, even though it does not rule out acceptability of the premisses and does not require acceptability of the conclusion independently of the premisses… An inference claim is thus the claim that a counterfactual-supporting covering generalization is non-trivially acceptable (Hitchcock 2011, p. 209).

This conception still seems correct to me. It should be pointed out perhaps that it is an ontic conception of inferential support, not an epistemic one. That is, the conclusion of an argument might have inferential support as defined above even though an addressee of the argument was not aware of its having this support. For example, consider an argument for a mathematical theorem that for a long time was merely a conjecture, such as the four-colour theorem in topology, which, informally stated, holds that, "given any separation of a plane into contiguous regions, producing a figure called a map, no more than four colors are required to color the regions of the map so that no two adjacent regions have the same color" ('Four-color theorem', *Wikipedia*, accessed 2016 01 17). The theorem was proved by computer in 1976. Prior to its proof, someone might have produced an argument for the theorem whose premisses were all the ultimate premisses of the very complex chain of reasoning engaged in by the software. This argument would clearly have the kind of inferential support defined above, but in advance of the proof having been produced nobody would have a good reason to believe that it had the required support.

Conversely, an addressee of an argument might have good reason to believe that the argument had inferential support as defined above, even though in fact it lacked such support. The good reason would by definition have to be defeasible, but there are many situations in which it is reasonable for us to form a judgment on the basis of defeasible reasons. Consider for example a counterfactual-supporting generalization that is now known to be false but that was previously believed for good reasons to be true, say that stomach ulcers are not an infectious disease. Prior to the discovery in 1982 that most ulcers are caused by an infection with a type of bacteria called Helicobacter pylori, there would have been good reason to infer from the

diagnosis of a patient as having a stomach ulcer that there was no point in treating the patient with an antibiotic.

These two sorts of counterexamples indicate that the appropriate criterion for good inference in one's own reasoning and in the appraisal of arguments that one encounters is whether there is good reason to think that the inference meets the condition defined above.

Aside from articulating in its most developed form my conception of good inference, the 2011 paper responded to a number of claims by scholars that the inference claim in a piece of reasoning or argument was not a claim that a certain kind of covering generalization deserved acceptance but was rather a singular claim that the conclusion was acceptable if the premisses were. These responses still seem correct to me. In particular, nobody has put forward an example where an argument's associated material conditional can be justified without either committing oneself to a covering generalization of the argument or appealing to the unacceptability of a premiss of the argument or to the acceptability of its conclusion. Thus, even if one takes the 'connecting premiss' or 'enabler' or 'warrant' of an argument to be its associated material conditional, and one relies on pragmatic considerations to rule out use of the paradoxes of material implication to justify it, it appears that one must take the arguer as committed for pragmatic reasons to a covering generalization of the sort articulated in the above definition.

In proposing restrictions on the concept of consequence to rule out trivial satisfaction of the covering generalization requirement, I appealed to a number of articles by the logician Neil Tennant in which he developed an account of proof in a formal system that ruled out proof of the principles *ex falso quodlibet* (from a [logical] falsehood anything follows) and *e quolibet verum* (from anything a [logical] truth follows). Subsequently, Tennant has developed a more refined logic that not only rejects those principles but also, he claims, provides an adequate underlying logic for all axiomatized mathematical and scientific theories. He calls this more refined logic "core logic" (Tennant 2017). Whereas in his previous work Tennant retained the non-relevantist conception of logical consequence and imposed restrictions only on the concept of deducibility, he is at the time of writing working out a way to show that his core logic captures the concept of logical consequence.[6]

[6]I asked Tennant to confirm that he now identifies the concept of logical consequence with what is deducible in his core logic. He responded as follows:

> I think the best way to answer your question is that I regard the proof system of (classical) core logic as establishing exactly those arguments that are not only truth-preserving (in the orthodox sense) but also relevantly so, in the precisely explicated sense of relevance that you will find in the attached paper (Tennant 2015). I am convinced that any attempted strengthening of that explication leads to false negatives—i.e., arguments that the strengthened explication deems non-relevant (even though valid) but which ordinary intuition tells one jolly well are relevant (in the sense that needs explication).
>
> That having been said, I am now trying to develop an inferentialist theory of definitions, according to which the inferentialist definition of the double-turnstile of classical semantics

My article "Inference claims" justified its choice of the intermediate criterion of a counterfactual-supporting covering generalization by the requirement that an inference-licensing covering generalization should be capable of being known independently of knowing the truth-value of the conclusion whose inference it is licensing, on pain of vicious circularity in the reasoning. The justification works in one direction: if an acceptable generalization covers counterfactual as well as actual instances, then its justification does not depend on knowing first the truth of the consequent for each instance with a true antecedent. But it does not work in the other direction: some independently knowable covering generalizations do not support counterfactual instances, such as the generalization mentioned in the article that all spheres of pure gold have a diameter less than a mile. At the time of writing the present postscript, it seems to me best to bite the bullet in favour of the criterion of counterfactual support, i.e. to require that inference-licensing generalizations support counterfactual instances. Thus the conclusion of the following argument, mentioned in the article, does not follow from its premiss:

(17) This sphere is pure gold, so its diameter is less than a mile.

It is not being a sphere of pure gold per se that makes its diameter less than a mile. Rather, it is the accidental fact that the cost of making a sphere of pure gold with a diameter of a mile or more is prohibitive. Such accidental facts, although they provide a basis for knowing the truth of a covering generalization like that of argument (17), intuitively are not enough to give such generalizations the power to license inferences. If a sphere of pure gold had a circumference of four miles, it would not have a diameter less than a mile. This hypothetical counterexample, it seems to me at the time of writing, is enough to undermine the inference from a sphere's being made of pure gold to its having a diameter less than a mile.

10.6 "Material Consequence and Counterfactuals" (2013)

"Material consequence and counterfactuals" was presented at the successor conference two years after the one where "Inference claims" was presented. It takes up the challenge by Robert Ennis at the 2011 conference to my claim that some non-law-like generalizations, such as the generalization that whoever lives in the White House lives in Washington, support counterfactual instances.

(Footnote 6 continued)

will result in a logical consequence relation that coincides exactly with the single turnstile of the classical core proof-system. This is because the metalogic itself, within which one pursues the consequences of one's inferentially formulated definitions, is "core-ified". But it will be some time before I am able to offer the fruits of these labors for wider consumption! Moreover, if I fail to get this 'inferentialist' version of double turnstile to match my single turnstile exactly in extension, I shall be satisfied with the fall-back position described in the previous paragraph. (e-mail communication, 2016 02 16)

The paper begins by arguing, through a series of counterexamples to alternative proposals, that the right condition for the material consequence relation is neither that an argument have a merely true covering generalization nor that it have a necessarily true covering generalization, but rather that it have a true covering generalization that supports counterfactual instances. This part of the paper thus tries to bolster the requirement in the 2011 paper that an inference-licensing covering generalization support counterfactual instances. The conception of material consequence in the 2013 paper lacks, however, the extensions proposed in the 2011 paper to arguments whose conclusions are not asserted and to modally qualified covering generalizations. The omissions were due to the paper's focus on the truth-conditions for counterfactual singular statements, and do not represent a change of view. The full statement of my position on the consequence relation remains that of the 2011 paper.

The paper does not take a definite position on the semantics of counterfactuals. Rather, it compares the results of applying two proposals for their interpretation, the closest-world semantics of Lewis (1973) and the structural model semantics of Pearl (2009), and concludes that for the examples chosen Pearl's semantics is easier to apply and gives intuitively correct results. For these reasons, Pearl's semantics of counterfactuals still seems attractive to me. But there is considerable scope for more research on the truth-conditions for counterfactual claims. What is clear is that we make counterfactual claims all the time and that often we are quite sure whether they are true or false, for good reasons. We know that the dense solid object that we are holding in our hand would fall to the ground if we let it go, that this emotionally agitated person would probably get even more agitated if we threatened him, that Stalin would probably have attacked Nazi Germany if Hitler had not attacked the Soviet Union first, and so on. We also need to recognize that sometimes we are completely in the dark as to what would be the case in a counterfactual situation. Counterfactual historiography is tempting, but rapidly runs into the problem that highly complex historical situations are impossible to rerun imaginatively by varying particular incidents. How would the world have developed if Jesus of Nazareth had died at birth? Who knows? An adequate semantics of counterfactual instances should conform to both our certainties and our uncertainties, and should have an intrinsic plausibility.

In his commentary on the 2013 paper, Brian MacPherson (2013) raised some of the issues that need to be addressed in considering the semantics of counterfactual statements. First, he argued that it was no easier on Judea Pearl's structural modal semantics than on the closest-world semantics of David Lewis to determine the truth-value of the counterfactual statement that Vladimir Putin would live in Washington if he lived in the White House, because there would be countless variables to be considered and countless structural equations relating these variables that might need to be changed. In reply (Hitchcock 2013), I conceded that there could be many more causal pathways than the one I considered through which Putin could come to live in the US White House, but added that, if asked to say whether Putin would live in Washington if he lived in the White House, I would need clarification of how he was supposed to have come to live there before having any

confidence in my ability to give a determinate answer to the question. This need seems to vindicate Pearl's structural equation modeling (SEM).

Second, MacPherson raised as an additional practical difficulty with SEM semantics that it is not always clear whether a variable is endogenous (inside the causal model) or exogenous (outside it, and thus uninfluenced by variables inside it). My response conceded the point, and suggested that if so a query about a counterfactual situation should specify what causal mechanisms are assumed to be at play in it.

Third, MacPherson suggested that a real advantage of an SEM semantics for counterfactuals over a closest-worlds semantics is its greater generality.

Fourth, MacPherson contended that SEM semantics is inapplicable to mathematical counterfactual statements, since in a mathematically counterfactual situation there are no structural equations causally relating endogenous variables. In response, I suggested extending causal modeling to the modeling of non-causal determination relations, such as the determination of the area of a circle by its diameter (and vice versa). Closest-world semantics may thus not be the only way to go in evaluating counterfactuals in logic and mathematics.

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Part III
Patterns of Reasoning

Chapter 11
Validity in Conductive Arguments

Abstract An appeal to features of some case in support of attribution of some status to that case is non-conclusively valid if and only if it is not conclusively valid but any case with those features either has the status or has some overriding negatively relevant feature not implied by lacking the status.

11.1 Conclusive Validity

Suppose someone advances the following argument:

> Cattle are monstrously inefficient. Even in good areas they convert only 5% of the potential food in the grass into meat.

Suppose also that sheep are efficient, or at least not monstrously inefficient, even though in good areas they too convert only 5% of the potential food in the grass into meat. Clearly it would be relevant to raise this fact as an objection to our sample argument, an objection that the conclusion does not follow from the premiss.

Our objection consists in citing a counterexample: a parallel **case** in which the analogue of the premiss is true but the analogue of the conclusion is false. The analogue results from substituting for the word "cattle" in the original argument the word "sheep".

Substitutions for other words in the argument do not produce relevant objections. We could, for example replace "inefficient" by "small", and point out that cattle are not monstrously small, even though in good areas they convert only 5% of

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the food in the grass into meat. Our remark, though unexceptionable, is no criticism of the original argument.

This sample argument was more or less arbitrarily chosen: it is a simplified version of the first argument I found when I looked in the papers on my desk for an example.[1] My point is perfectly general. In assessing whether any argument's conclusion follows from its premiss(es), we regard certain components as fixed and others as variable. Parallel cases with true premiss(es) and a false conclusion are counterexamples which show that the conclusion does not follow if they arise by substitution on the variable components, but are not counterexamples if they arise by substitution on the fixed components.

I propose to use the expression "conclusive validity" in a wide sense according to which an argument is conclusively valid just in case it transmits truth from its premiss(es) to its conclusion.[2] We can alternatively label this circumstance one in which the conclusion is a consequence of, or follows from, the premiss(es). The notion of transmitting truth is a metaphorical indication of the concept of interest, which needs to be made more precise. It is intended, however, to be stronger than merely material "implication": the mere fact that we do not have true premisses and a false conclusion is not enough to show that the argument transmits truth from premisses to conclusion.

With this terminology, we can express our point about parallel cases as a necessary condition for conclusive validity: an argument is conclusively valid only if no intra-categorial[3] substitution on its variable

[1]The simplification was for ease of presentation, and does not affect the point that only certain parallels are relevant objections. The actual argument read: "Cattle are monstrously inefficient. Even in a good area like England they convert only 5% of the potential food in the grain into meat, whereas in the tropics they destroy all the land they're allowed to roam over." (James Lovelock, *Harrowsmith* November/December 1988, quoted in *SHAIR International Forum* (April 1989), p. 1.1).

[2]The expression is meant to leave open the possibility of non-conclusive validity. I follow such authors as Carl Wellman (1971) and Stephen Thomas (1986) in allowing that an argument can be valid even though it does not transmit truth from its premisses to its conclusion.

[3]The restriction to the same category (i.e. ultimate genus) is meant to rule out such spurious counterexamples as the one provided in Plato's *Euthydemus*. The following argument is evidently valid: That pen is mine: that pen is a Bic; therefore, that pen is my Bic. The following argument is an apparent counterexample: That dog is mine: that dog is a father; therefore, that dog is my father. But the counterexample is only apparent, because "Bic" is a substantive term designating an object, whereas "father" is a relational term designating a relatum.

In some arguments it seems reasonable to restrict the range of substitution to a subcategory. Consider the argument: Marijuana should be legalized, because it is no more dangerous than alcohol, which is already legal. A possible counterexample is the argument: Driving without a seat-belt should he legalized, because it is no more dangerous than hang-gliding, which is already legal. But this objection seems unfair, since the argument focuses on two mood-altering drugs, and need not generalize its principle beyond that clam. Tomis Kapitan (1982), however, has pointed out (p. 209) that, if restriction can be to any class, any argument with a false premiss or a true conclusion will be valid; he suggests that subcategories must be essential to the items designated by the variable components.

components[4] produces a counterexample (i.e. a parallel in which the analogue of the premiss(es) is true but the conclusion's analogue is false). To avoid the problem of identifying which components are variable, we can alternatively say that an argument is conclusively valid only if there is a non-empty[5] set of its components on which no intracategorial substitution produces a parallel argument with true premiss(es) and a false conclusion.

This condition can be met trivially, if there is a non-empty set of components for which no substitution makes all the premisses true or no substitution makes the conclusion false. In such cases, however, where the premisses cannot be true, or the conclusion cannot be false, it seems odd to speak of the argument as "transmitting" (sending across) truth from premisses to conclusion. A more restrictive formulation of this condition would rule out such trivial cases by stipulating that at least one substitution produces true premiss(es) and at least one substitution produces a false conclusion. An important result, due to Bolzano (1972/1837), is that an argument will be conclusively valid in this restricted sense only if at least one of its variable components occurs both in a premiss and in the conclusion. This result simplifies the practical problem of testing for conclusive validity, since one can begin with the component which is common to premiss(es) and conclusion.

This substitutional or variational conception of validity is connected to an alternative conception which we might call formal or schematic.[6] The condition that no substitution produces a counterexample is equivalent to the condition that the form or schema produced by replacing the variable components with distinct variables has no instances with true premisses and a false conclusion. And this condition in turn is met if the universal generalization over those variables of the argument's associated material conditional—the material conditional whose

(Footnote 3 continued)

Since we do not have a fully worked out theory of categories for natural languages, this conception of conclusive validity is to that extent schematic. In practice, however, uncertainties about the category of a variable component rarely cause problems.

[4]These components must be what 1 earlier (1985) called content expressions, expressions which in the context of their utterance can be regarded as referring to or otherwise signifying an actual or possible feature of the universe. Such content expansions can be molecular ("John's cat") as well as atomic ("cat").

[5]The requirement that the set be non-empty is meant to exclude purely material "consequence" in which it just happens that it is not the case that the premisses are true and the conclusion false. "3 is larger than 2, so China is the world's most populous country" is not a valid argument: there is no transmission of truth from premiss to conclusion.

[6]Kapitan (1982) distinguishes substitutional validity from formal validity. Rolf George (1992) contrasts a logic of variation with a logic of schemata. As George points out, there are differences in the conceptions of consequence associated with the two logics.

antecedent is the conjunction of the argument's premisses and whose consequent is the argument's conclusion—is true.[7]

Let me illustrate. Consider the argument: "Cows are herbivores, so they are not predators." This argument meets our substitutional necessary condition for validity, in that no substitution on "cows" produces a counterexample. This substitutional condition is equivalent to the condition that no instance of the form or schema "Fs are herbivorous, so F's are not predators" has a true premiss and a false conclusion. And this formal or schematic condition will be met if the generalized material conditional "For any kind K, if Ks are herbivores, then they are not predators" is true.[8]

We could thus articulate the formal conception of conclusive validity as follows:

> An argument "P. so c" is conclusively valid just in case it has a non-empty set of components $a_1 \ldots a_n$, such that for all $x_1, \ldots, x_n$, if $P(x_1, \ldots, x_n)$, then $c(x_1, \ldots, x_n)$.[9]

The generalization in this definition is to be interpreted as a law like generalization, capable of being rebutted by counterfactual truths. Thus, in the sample argument with which I began, it is not enough that all actual animals which convert only *5%* of the potential food in grass into meat are monstrously inefficient; it must also be the case that any hypothetical animal which did so would be monstrously inefficient.

For this reason, the substitutional conception provides (in general) only a necessary condition of validity, since it limits counterexamples to actual cases. The formal conception, on the other hand, seems to provide a condition which is both necessary and sufficient.

The formal conception can be restricted in the same way as the substitutional conception to rule out trivial cases where the premiss(es) cannot be true or the conclusion cannot be false.

Validity as thus defined is a broad concept, covering not only logical validity but also semantic validity and what we might call factual validity. We might distinguish these kinds on the basis that the covering generalization of a logically valid argument is a logical truth, containing only logical expressions and variables; the covering generalization of a semantically valid argument is a logical consequence of semantic postulates, true in virtue of the meaning of one or more non-logical expressions; and the covering generalization of a factually valid argument is a

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[7] As John Martin pointed out to me, the truth of this universally generalized conditional reflects the fact that metalinguistic principles stated as schemata are shorthand for universal quantifications over expressions. Strictly speaking, then, this universally generalized conditional is a generalization over expressions and belongs to the metalanguage. But the corresponding statements in the object language, in which the expressions are used rather than mentioned, will also be true.

[8] This generalized conditional is in turn logically equivalent to the proposition: "No herbivores are predators", which "traditional logic" would identify as the "missing premiss" of this "enthymeme".

[9] $P(x_1, \ldots, x_n)$ is the result of replacing all occurrences of a_i in P (except those which are proper parts of another component a_j) with x_i, for $1 \leq i \leq n$. Similarly for $c(x_1, \ldots, x_n)$. As indicated in note 8, strictly speaking the formal conception of conclusive validity should be formulated metalinguistically, as follows: There are no expressions $e_1, \ldots, e_n$ such that, for $1 \leq i \leq n$, e_i is of the same category as a_i, $P(e_1/a_1, \ldots, e_n/a_n)$ is true, and $c(e_1/a_1, \ldots, e_n/a_n)$ is false.

factual truth, true in virtue of the way the world is.[10] And we could use the expression "formally deductively valid" for arguments which are logically valid, and the expression "deductively valid" for arguments which are logically or semantically valid, since these are the arguments for which it is impossible that the premisses be true but the conclusion false. But the distinction between logical truths, semantic postulates and factual truths is notoriously arbitrary, and not much is gained by making it.

11.2 Non-conclusive Validity

Despite its breadth, this conception of validity is not broad enough. Not all good arguments transmit truth from premiss(es) to conclusion; we should reject "inferential deductive chauvinism"[11]—the view that the only legitimate arguments are valid deductions—even in the wide sense of "valid" which I have advanced. Arguments often have an epistemic function of justifying their conclusions to their audiences. If we insist that arguments cannot perform this function unless they are valid, we will find ourselves filling out perfectly unexceptionable arguments with premisses which we cannot justify in our deductivist (or even conclusivist) straitjacket. Consider, for example, the argument: a cold front is heading our way, so it's going to start raining in the next few hours. This argument isn't conclusively valid, because sometimes cold fronts stall or change direction or dissipate, but it does (arguably) justify its conclusion, at least to the extent that for practical purposes it makes sense to assume on the basis of the premiss that the conclusion is true. But the extra premiss needed to make this argument conclusively valid—that no interfering factor will cause the front to stall or change direction or dissipate in the next few hours—cannot be justified by conclusively valid arguments.[12]

Conclusively valid arguments seem to force us to choose: either to accept the conclusion or to reject a premiss or to reject the underlying rule of inference.[13] Although arguments which are not conclusively valid are not compelling in the same way, there are strong pragmatic reasons for taking them to sometimes justify

[10]The word "factual" needs a broad interpretation here, since it must include evaluative claims. Consider, for example, the argument, "Strategic bombing of cities is intentional killing of innocent persons, so it is morally wrong". If valid, this argument is valid in virtue of the generalization, "Any intentional killing of innocent persons is morally wrong". This generalization would be a factual claim, according to the distinction made above.

[11]For the terminology, see Grünbaum and Salmon (1988, p. 2).

[12]See Hitchcock (1980, 1981). For other arguments against inferential deductivism, see Wellman (1971, pp. 10–11); Harman (1986, pp. 69–70); and articles by Carl G. Hempel, Wesley C. Salmon and Henry E. Kyburg Jr. in Grünbaum and Salmon (1988, pp. 19–36, 47–60, 61–94).

[13]Henry Kyburg Jr., however, has argued persuasively for a policy in reconstructing scientific reasoning of tolerating inconsistencies and not requiring deductive closure. See Grünbaum and Salmon (1988, pp. 61–94).

their conclusions. We have to act in the world, and our actions are more likely to accomplish their intended purposes if we make epistemically probabilistic predictions or rely on relevant but non-conclusive considerations than if we ignore such information.

This pragmatic justification, however, leaves unsolved the problem of articulating criteria for non-conclusive validity. The notion we want to capture is that of the relation between premisses and conclusion, short of conclusive validity, which is necessary and sufficient for an argument to justify its conclusion when other conditions for a good argument are met (such as an independent justification of the premisses and the absence of unstated overriding evidence against the conclusion).[14]

As Trudy Govier (1985) has noted, philosophers use counterexamples to criticize arguments for which only non-conclusive validity is claimed. This practice on the part of persons whom we can presume to be careful reasoners suggests that non-conclusive reasoning turns on variable components, just as conclusively valid reasoning does. I propose, therefore, to explore an extension of the conception of conclusive validity to include non-conclusive validity.

11.3 Conduction

I shall do so for only one pattern of argument which has been claimed to be sometimes non-conclusively valid. This is the pattern of argument which Carl Wellman (1971) christened "conduction" and defined as "that sort of reasoning in which (1) a conclusion about some individual case (2) is drawn nonconclusively[15] (3) from one *or* more premises about the same case (4) without any appeal to other cases" (1971, p. 52).[16] Wellman argued that there can be no logic of conduction in

[14]These conditions are epistemic. One could also, as Hamblin (1970) pointed out, adopt dialectical criteria for a good argument, e.g. that the premisses are among the commitments incurred by the interlocutor in the conversation. I mean the account of validity in this paper to be usable in a variety of accounts of good argument. The conception of validity is in Hamblin's terms "alethic", resting as it does on the truth of a covering generalization. But investigating the truth of such a generalization will usually involve implicit appeal to epistemic criteria. In a dialectical context investigation will have to proceed by agreement among the interlocutors.

[15]As I have argued elsewhere (1980, 1981), arguers generally neither tell us nor are aware of whether they are drawing their conclusions conclusively or non-conclusively. 1 would therefore prefer to characterize a conductive argument as one in which the conclusion does not follow conclusively rather than as one in which it is drawn non-conclusively.

[16]These arguments include what I referred to in my textbook (1983) as "balance-of-considerations arguments", where negatively as well as positively relevant premisses occur. Wellman's examples are all arguments where the conclusion expresses a verdict or decision about how to act on, evaluate or classify the case. But the definition fits an argument like "Bessy is a cow, so she is brown", where the conclusion is independently testable. If we wish to exclude such arguments, we would have to add a further condition that the conclusion is not even in principle testable in itself.

any interesting sense, and in particular that there are no criteria by which to judge whether a conductive argument is valid. The way to judge its validity, he wrote, is to think through the argument: "… it is always possible to check up on any verdict arrived at in this way simply by thinking through the argument again. And if this does not resolve all doubt, one can always think the argument through once more" (1971, p. 80).

This advice is unhelpful. It seems to leave the judgment of validity to a purely subjective mental process, which could vary from one individual to another. If two individuals each think the same argument through several times and come to different verdicts on its validity, Wellman gives them no way to try to resolve their disagreement rationally.

It is not much more helpful to say that the premisses must be separately relevant to the conclusion and that the positively relevant premisses must jointly outweigh the combined force of any negatively relevant premisses. For we need an explication of the concept of relevance involved here. Explications like "counts in favour of its truth (falsity)" or "increases the likelihood that it is true (false)" merely rechristen the problem; as John Woods has convincingly argued (1994), we need a semantics for "contributes to the truth of" which is weaker than material implication and different from conditional probability.

Let us see, therefore, how far we can get by reflecting on counter-exampling as a way of criticizing conductive arguments. Consider an argument for concealing bad news from a patient: "You shouldn't tell him he has terminal cancer, because it will cause him severe distress." An attack on the relevance of the premiss might go as follows: "You might as well say that you shouldn't give a failing grade to this student's abysmal paper, because it will cause her severe distress." This is the right sort of counterexample,[17] and we may suppose that the arguer agrees that an abysmal paper should get a failing grade even when the grade will cause the paper's author severe distress.

Since we are by hypothesis dealing with an argument which is not conclusively valid, the counterexample is not a decisive attack on the argument's validity. The arguer may reply: "But the grading system obligates you to give a failing grade if

[17]According to the result mentioned in Sect. 11.1, if the argument is valid, at least one of its variable components will occur in both the premiss and the conclusion. (By hypothesis, the argument is not conclusively valid, so it will not be trivially conclusively valid.) The repeated components are "him", "tell him he has terminal cancer" (repeated in the pronoun "it"), and the components of "tell him he has terminal cancer". The use of the pronoun "it", however, indicates that "tell him he has terminal cancer" is to be taken as a single component in looking at the form of the argument. Substituting only for "him" gives the argument an unduly narrow scope; as I have argued elsewhere (1985, 1987), any repeated content expression is to be taken as variable unless it would be implausible to do so. Substituting only for "tell him he has terminal cancer" would make it difficult to find parallel arguments with true premisses.

Added in the present republication: Reflection on this example indicates that the "him" in "tell him he has terminal cancer" needs to be treated as a separately variable component, in order to link with the "him" in "cause him severe distress". Thus the most plausible interpretation of the argument involves treating as variable components "him" and "tell he has terminal cancer".

the student's work is unsatisfactory. There's no similar system obligating you to tell a patient he has terminal cancer." The reply alleges that the parallel case has an overriding feature, not present in the original case, and thus neutralizes its force as a counterexample. The critic who maintains the irrelevance of causing severe distress must either challenge the negative relevance of the obligations internal to the grading system or produce another counterexample in which no overriding factor appears to be present.

Generalizing from this example. we can articulate a substitutional necessary condition for non-conclusive validity of conductive arguments: a conductive argument is non-conclusively valid only if there is no parallel case which has the feature(s) cited in the premiss(es) but lacks the property inferred in the conclusion and also lacks overriding features which are negatively relevant to the conclusion.

Here is a simple example of an argument which meets this condition: "Harry was born in Windsor. Ontario, so Harry is a Canadian citizen." Under Canadian law at the time of writing this paper, any person born in Canada is a Canadian citizen unless that person has taken an oath renouncing prior citizenship while becoming a citizen of another country. Since Windsor, Ontario, is in Canada, any person born there who is not a Canadian citizen will have the overriding feature of having renounced prior citizenship while becoming a citizen of another country. So there will be no person who resembles Harry in having been born in Windsor, Ontario, but is not a Canadian citizen and has not renounced prior citizenship.

The overriding negatively relevant features mentioned in the substitutional conception of conductive validity must not follow deductively from the absence of the property inferred in the conclusion.[18] Otherwise every conductive argument will be non-conclusively valid. For any parallel case which has the feature(s) cited in the premiss(es) but lacks the property inferred in the conclusion will possess any features which deductively follow from the absence of that property. If any such feature is allowed to count as an overriding negatively relevant feature, then there will be overriding negatively relevant features in any parallel case which lacks the property inferred in the conclusion.[19] It will be impossible to find a counterexample.[20]

Furthermore, it seems necessary to stipulate that the novel feature must be relevant. If one required that the parallel case possess no feature not present in the

[18]*Added in the present republication*: The formulation is elliptical. What is meant is that the proposition that the case under discussion has overriding negatively relevant features must not follow deductively from the proposition that the case lacks the property inferred in the conclusion.

[19]I owe this insight to Robert Pinto, who pointed out in a commentary on an earlier unpublished paper of mine (1986) that my formulation of the condition that there be no overriding negatively relevant features by itself entailed the conclusion, since it allowed the absence of the inferred property to be one such overriding feature.

[20]In a paper entitled "Relevance as a theoretical constraint in accounts of argumentation," delivered at the Third International Symposium on Informal Logic, John Woods gave as the first condition of adequacy for an account of relevance that it be neither null nor universal. That is, some cases should be relevant and others irrelevant. Woods' condition is a reasonable demand which I am trying to meet.

original case, then there could be no counterexample, since any numerically distinct parallel case will possess at least one novel feature, assuming that indiscernibles are identical. But we want our test to allow counterexamples: sometimes conductive arguments cite irrelevant considerations.[21]

The need to stipulate that the novel feature must be relevant suggests that we cannot get rid of the notion of relevance in our explication. But the explication is recursive, not merely circular. We must start with cases where the relevance of the consideration is apparent (or, from a dialectical perspective, accepted by all interlocutors). But there is room for rational discussion of the relevance of any suggested consideration, as long as the discussants can agree on relevance in some cases.

Instead of looking for counterexamples to our sample conductive argument, a critic could examine the truth of its covering generalization: One should not do to someone what will cause that person severe distress.[22] The argument will be non-conclusively valid if and only if this generalization is true in all cases except those where there is an overriding relevant reason why it is permissible to cause a person severe distress, in which exceptional cases the generalization will be false. Such a *ceteris paribus* generalization could be defended by appeal to a more general principle, for example, that one should not harm someone, and that causing someone severe distress without an overriding reason for doing so is harming that person.

Generalizing from the example, we could formulate a formal conception of non-conclusive validity for conductive arguments as follows: A conductive argument "P(a). so c(a)"[23] is non-conclusively valid if and only if it is not conclusively valid but, for any situation x, if P(x) then either c(x) or x has an overriding negatively relevant feature F which not c(x) does not deductively imply.[24]

On this conception it is difficult to show that a conductive argument is invalid. One might suppose that the following conductive argument has an irrelevant premiss: "You shouldn't tell this patient he has terminal cancer, because you will feel

[21]Will even this restriction save this account of relevance from apocalyptically counting all considerations as relevant? Take an obviously irrelevant consideration: the colour of a car is irrelevant to how well it performs. Now consider the argument: "This car is yellow, so it will run well." An objector will point to a yellow car which runs badly. But the arguer can always in any such case point to some feature of that car which makes it run badly (the electrical system tends to fail in wet weather, the engine is noisy, etc.), and can regard that feature as one which overrides the car's yellow colour. We seem to need a parallel case in which the purportedly relevant feature is not just present but obviously irrelevant.

[22]Such a procedure would be necessary in order to argue for conductive validity in cases where the relevance of the premiss(es) was not obvious. Failure to find a counterexample might reflect a deficient imagination, rather than the invalidity of the argument.

[23]a is the case which the conductive argument is about.

[24]If one attempts to formulate this latter condition in the style of a recognized formal system, one seems to come up with an infinite sentence: For any situation x. if P(x) then either e(x) or there is a feature F such that x has F, not c(x) is consistent with x's not having F, and for any situation x_1, if $P(x_1)$ and x_1 has F then either not $c(x_1)$ or there is a feature F1 such that $_{x1}$ has F, $c(x_1)$ is consistent with x1's not having F1, and for any situation x_2, ….

awful if you do so." One could try to bring out this irrelevance by objecting: You might as well say that you shouldn't attend a friend's funeral, because you will feel awful if you do so. But there is a reply to this objection: It is a mark of respect to one's friend to attend her funeral, and that is a reason for attending it which is (at least arguably) not present in the case of telling a patient he has terminal cancer. It is difficult to find a counterexample where there is not some negatively relevant feature which is absent from the original case. In this instance one might have to concede that feeling awful while one did something was a good reason for not doing it, and fall back on the objection that it was not a very strong reason.

The example illustrates an implication of this conception of non-conclusive validity: conductive arguments will turn out to be valid even when the reason given for the conclusion provides very weak support for it. Even worse, they will turn out to be valid even when there are unstated overriding reasons why the conclusion is false. These implications of the conception, though initially objectionable, are but a specification of the common-place that non-conclusively valid argument can have true premisses and a false conclusion. Pronouncing an argument non-conclusively valid and its premisses justified does not finish the task of evaluating that argument. The evaluator must also look for other relevant features of the situation which might tip the judgment the other way. What responsibility does the author of a conductive argument have for taking such other relevant considerations into account? Someone who is reasoning out what to do or how to evaluate or classify on the basis of relevant but non-conclusive considerations needs to look particularly for features of the situation that are negatively relevant to the conclusion at which she arrives, in order to make sure that the positively relevant features do indeed outweigh the negatively relevant features. An arguer out to convince an audience will be moved somewhat by rhetorical considerations concerning the reasons that are likely to occur to the audience; from a logical point of view, the arguer needs to mention enough positively relevant considerations to outweigh any negatively relevant considerations that he can reasonably be expected to know are present in the situation.

An arguer or reasoner who knowingly overlooks overriding (and not overridable) negatively relevant features of a situation can be charged with suppressing evidence. An arguer or reasoner who unknowingly overlooks such features can be faulted for doing so if he can reasonably be expected to be aware of such features, but otherwise is not at fault. The fault might be described as one of overlooking evidence. Where such overriding features are brought to his attention, however, he will be compelled either to strengthen the premisses so that the positively relevant features outweigh the negatively relevant ones or to abandon the conclusion. In this sense, the author of a conductive argument is committed to the proposition that there are no unoverridable overriding negatively relevant features in the situation. We could if we liked add such an open-ended proposition as an additional premiss to any conductive argument, an addition that would make the argument conclusively valid. But we would have to put a mark against this premiss to indicate that the arguer had the responsibility to justify it only to the extent of taking into account any negatively relevant features of which she was aware or could reasonably be expected to be aware.

11.4 Conclusion

In an earlier unpublished paper (1986) I advanced the thesis that non-deductive arguments could be treated as if they were deductive, as long as one recognized that the proposition one added to make the argument deductively valid was not entirely the responsibility of the arguer, that it could in certain respects be presumed to be true unless shown otherwise. This position I called methodological deductivism. 1 no longer accept the criteria I advanced in that paper for identifying the proposition to which the author of a non-deductive argument is committed. And I would now prefer to use the language of the present paper and ask whether any non-conclusive argument can be treated as if it is conclusive, by adding a proposition to which the argument commits its author, with the proviso that in some respects this proposition is to be presumed to be true until shown otherwise. A positive answer to this question we might label a position of methodological conclusivism. In the case of conductive arguments, methodological conclusivism has turned out to be true. But of course there are many other non-conclusive arguments—enumerative induction, statistical generalization, arguments to and from the best explanation, arguments by empirical and a priori analogy—which will need to be examined to see whether the approach of this paper can be extended to them and whether, if it can be, methodological conclusivism is true in those cases as well. There are also questions about the pedagogical usefulness of this approach, which I have not raised in this paper.

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Chapter 12
Reasoning by Analogy: A General Theory

Abstract In reasoning by analogy, we project a queried property from one or more source cases to a target case on the basis of one or more assumed similarities. There are three ways in which such reasoning can be inferentially sound. First, the variables of which the assumed similarities are values may determine, tightly or loosely, the variable of which the queried property is a value. Second, we may recognize that the source cases have the queried property in virtue of having the assumed similarities. Thirdly, and most weakly, sources and target may share many and varied similarities and have few dissimilarities.

In arguing by analogy we reason from an assumed likeness between a case of interest (the *target)* and one or more other cases (the analog cases or *sources)* to some further resemblance. To think about whether the conclusion of such an argument follows from the premisses advanced in its support is to engage in critical thinking.

Is evaluating analogical inference a general critical thinking skill? We might discover that there are people who are generally good at evaluating analogical inferences, who recognize both good analogies and faulty analogies when they see them. The existence of such people would not prove that there is a general skill at work in the strong sense of some single semipermanent mental or neurological structure causally responsible for their consistently good performance. Again, we might abstract from their performance, or derive from theoretical reflection, a general criterion of good analogical inference. But the mere existence of such a criterion would not show that one can make people generally good at evaluating analogical inferences by inculcating the criterion in a general way.

On the other hand, the nonexistence of a field-transcendent criterion for evaluating analogical inferences would show that there was no general skill of evaluating

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analogical inferences. If their evaluation was field specific, as Toulmin (1958) claims, then we would have to accept the doctrine which Ennis (1992) calls "epistemological subject specificity" for this aspect of critical thinking.

My concern in this chapter is to develop and defend criteria for good analogical inference. Although the criteria are disjunctive, each criterion in the disjunction straddles fields, in any reasonable sense of that vague term. The same criterion applies, for example, to Paley's famous argument (1802/1963) for the existence of God from the analogy between the eye and a watch, and to a real estate appraiser's estimation of the market value of a property on the basis of the sale price of recently sold comparable properties. These arguments by analogy obviously belong to different fields. I am therefore arguing against epistemological subject specificity for the critical thinking skill of evaluating analogical inferences. More positively, I am arguing for epistemological generality.

I have chosen this test case for epistemological subject specificity because it is a good test also of a general theory of good inference which I have been developing (Hitchcock 1985, 1987). The experts differ markedly in their views about what constitutes good analogical inference. Some (Beardsley 1950; Keynes 1921; Nagel 1961; Stebbing 1939) think there is no such thing: "the suggested conclusion stands just as much in need of testing as though it had never been arrived at by the process of thinking by analogy" (Stebbing 1939, p. 121). Others (Copi 1986) give a list of criteria, the most important being the relevance of the assumed similarities to the inferred similarity; this concept of relevance requires clarification. Still others (Govier 1985b; Levi 1949; Wisdom 1991) point to a different kind of analogical inference, but give no evaluative criteria for it.

A general theory of good inference ought to be of some help in sorting out such a confused theoretical situation. If the theory has merit, it will suggest independently acceptable criteria for good analogical inference. My strategy, therefore, will be to motivate and sketch my general theory of good inference, then to use it as a heuristic device for constructing a succession of criteria for good analogical inference, each of which will be considered on its merits. To the extent that the meritorious criteria for good analogical inference cohere with my general theory of good inference, they will not only refute epistemological subject specificity but also confirm my general theory of good inference.

12.1 Good Inference

From an early age we criticize inferences by constructing a parallel argument with true premisses and a false conclusion. We can illustrate the practice with this imaginary but realistic dialogue between a mother and her four-year-old son:

MOTHER: You can't have any dessert, because you didn't eat your peas.

SON: But Mary didn't eat her peas, and she got dessert.

Here the child describes a state of affairs in which an argument parallel to his mother's, with "Mary" substituted for "you," has a true premiss but a false conclusion. Such a description is an objection that his mother's conclusion does not follow: she is not entitled to conclude from the fact that he did not eat his peas that he can't have any dessert.

In raising such objections, we are selective about which parts of an argument are subject to substitution in constructing a counter-exampling parallel argument. We make substitutions only on what I have elsewhere (Hitchcock 1985, 1987) called content expressions, whether simple or complex. And we do not make substitutions on all of them. Nobody would object to the argument, "Oak trees are deciduous, so they drop their leaves in the fall," for example, by constructing a counter-exampling parallel argument by substitution on both "oak" and "deciduous": "Spruce trees are coniferous, so they drop their leaves in the fall." In general, we confine substitution to content expressions that are repeated, and we regard as subject to substitution at least one repeated content expression that occurs both in the premisses and in the conclusion.

If the existence of a counter-exampling parallel argument is not just a sufficient but also a necessary condition for bad inference, we can (by contraposition) take the nonexistence of such a counterexample as a necessary and sufficient condition for good inference. That is, there would be a good inference when (and only when) there was one or more repeated content expressions on which no substitution produced true premisses and a false conclusion.

On this conception of good inference, the condition in which a conclusion follows from certain premisses may be a substantive fact about the world or a normative principle. Such an argument does not have a missing premiss; its conclusion follows from just its explicit premiss(es), only not formally. The argument is, as we might say, materially or enthymematically valid.

As one might expect, the basic account of good inference that I have just motivated and sketched requires elaboration to cope with counterexamples. One needs restrictions, for example, on the type of substitution. In the first place, it must be uniform, in the sense that every occurrence of a content expression being replaced is replaced by an occurrence of the same substitute content expression. Secondly, it must be within the same logical or metaphysical category, to avoid spurious refutations like the argument in Plato's *Euthydemus* (Plato 1961, 298d–e) that, since that dog is yours and is a father, that dog is your father; thus the full elaboration of the theory would require a theory of categories, perhaps a formal grammar in the style of Montague (1974). Thirdly, in some cases it may be within a subcategory; the argument, for example, that marijuana should be made legal, because it is no more dangerous than alcohol, which is already legal, is most plausibly interpreted as resting on a principle specific to mind-altering drugs, so that it would be unkind to object that driving without a seat belt should not be made legal, even though it is no more dangerous than hang gliding, which is already legal.

Again, Bolzano, who seems to have first articulated this theory (1837/1972), perhaps on the basis of medieval precedents, wanted to rule out trivial cases in which there was no counterexample because no substitution could make the premisses true or no substitution could make the conclusion false; more recently, George (1983) has followed him in this respect. To achieve this end, one adds requirements that at least one substitution on the variable content expressions makes the premisses true and at least one substitution makes the conclusion false. A consequence of these added requirements is that an argument with a good inference has a content expression repeated in a premiss and the conclusion.

Again, counterexamples. to arguments with normative or conceptual conclusions may have purely hypothetical premisses.

So elaborated, this conception of good inference applies to arguments where we look for truth-preservation between premisses and conclusion, that is, what we might call conclusive arguments. It can be extended to arguments where we are prepared to be satisfied with a merely probable or provisional (provided that there are no overriding considerations) transmission of truth from premisses to conclusion. For with these arguments too, as Govier (1985a) has pointed out, we use the technique of refutation by logical analogy, a technique which implies that there is a good inference only if there are content expressions on which substitutions which produce true premisses also produce a true conclusion—either for the most part, or subject to provisos. The extension of the conception of good inference to these looser arguments would therefore consist in qualifying the requirement that every substitution producing true premisses also produces a true conclusion.

These elaborations and qualifications are incorporated in the following complicated conception of good inference:

> The argument contains one or more repeated content expressions on which uniform substitutions within a category or subcategory sometimes make the premisses true, sometimes make the conclusion false, and either always, mostly, or provisionally make the conclusion true when they make the premisses true.

This is the conception of good inference which I shall apply to arguments by analogy. I shall refer to it as "the general conception of good inference," thus alluding both to its *general* application to all inferences and to its key requirement that there be a true *generalization* of the conditional proposition that, if the premisses are true, then the conclusion is true.

12.2 Reasoning by Analogy

In reasoning by analogy, as I indicated at the beginning of this chapter, we project a property to a case of interest from one or more similar cases.

"Cases should be understood broadly; a case might be a legal case, an ethical situation, a natural phenomenon (token or type), a concrete object, and so forth. Following a customary terminology (Helman 1988), I shall refer to the case of

interest as the target (also called the primary subject), to any of the similar cases as a source (also called a base, analog, precedent, or comparable), to postulated similarities as predictor properties, and to the inferred further similarity as the queried property. The form of an analogical inference is thus as follows:

> The source(s) and the target are alike in having the predictor properties. The source(s) has (have) the queried property. Therefore, the target has the queried property.

In everyday conversation, and in such strongly persuasive discourse as political speeches and advertising, the shared predictor properties are often not explicitly mentioned; the premiss is simply that the target is like the source. In the most elliptical cases even the queried property is unmentioned and the conclusion is left unstated. (President of the Ontario Flue-Cured Tobacco Marketing Board: "This anti-smoking thing is like trying to ban sex.") Arguments by analogy are common. In court proceedings, lawyers and judges reason about non-straightforward cases by citing precedents, analogizing the instant case to some of them and distinguishing it from others. In moral casuistry, moralists will decide a case with reference to a comparable case, for example, by analogizing the withholding or cessation of artificial feeding of a terminally ill patient to the withholding or cessation of artificial ventilation. Analogies between a currently unexplained phenomenon and one which is well understood will suggest a hypothesis for investigation in scientific research; in all probability, for example, the explanation of solar eclipses started out as an analogical extension of what happens when an opaque object comes between a light source and something it illuminates. Analogies are used in science not only to suggest hypotheses, but also to justify them; a well-known example is Darwin's argument for the theory of natural selection by analogy to the effects on domesticated animals of artificial selection. Students trying to solve mathematical and science problems use strategies based on the similarities they see to previously worked problems; an important difference between good and bad solvers is that the bad ones focus on superficial but misleading similarities, whereas the good ones grasp the deep structural similarities (Perkins and Simmons 1988). In rhetorically charged contexts, the analogies used are usually suspect. But one everyday use of analogical reasoning which is carefully worked out and commonly accepted is in real estate appraisal, where the market value of a property is sometimes inferred by projecting the selling prices of a group of recently sold comparable properties. And arguments from analogy are used in philosophy, as in standard arguments from design for the existence of God, Hume's critiques of those arguments, arguments for the existence of other minds, and Thomson's famous argument (1971) from the outrageousness of an argument deployed in the hypothetical case of an unconscious violinist to the faulty character of what she takes to be the standard argument for the impermissibility of abortion.

12.3 Similarity-Based Criteria for Good Analogical Inference

Our general theory of good inference enjoins us to consider for any piece of reasoning by analogy whether it has a covering generalization which is definitely or probably or provisionally true. Since any such argument will repeat the content expressions that refer to the target, the source(s), and the predictor and queried properties, and since any repeated content expression is a candidate for generalization, let us first try to generalize over them all. This gives us the purely formal general statement:

> If a target and some sources are alike in sharing some properties, then the target possesses any further property which the sources share.

Without some qualification, this generalization is clearly false. A counterfeit twenty-dollar bill, for example, may resemble a large number of real twenty-dollar bills in a large number of respects, but it is not legal tender, even though they are.

A more difficult question is whether this generalization is probably or provisionally true. At first glance, one would think not. Without any special assumption about a connection between the predictor properties and the queried property, we might suppose that properties are randomly scattered among cases in the universe, and thus the coinstantiation of predictor properties with the queried property in the source(s) will not increase the probability that the target, which possesses the predictor properties, will also possess the queried property.

In fact, however, as various theorists of analogical inference have noticed (Russell 1988; Shaw and Ashley 1983), we do not live in this sort of universe. Properties are not randomly distributed, but tend to cluster together. Days that are cloudless tend to be sunny, cases of homicide to be morally culpable, internally repetitive artistic creations to be banal. These clusterings occur for a variety of reasons. Sometimes there are causal connections between the properties (cause to effect, effect to cause, effects of a common cause). In other cases one of the properties is a supervenient property; this is true of deontological, axiological, and classificatory properties. Even if we are completely ignorant of the presence of such connections between the predictor properties and the queried property, the mere similarity of the target case to the source cases can provide a weak probabilistic basis for analogical inference. In the absence of background knowledge, it may be justifiable on pragmatic grounds to make analogical inferences on the basis of such mere similarities; perhaps infants do this. The weakness of such inferences may be illustrated by superstitious behavior in cases where we have every reason to think that there is only a chance coincidence of two properties; for example, an athlete who wins an important game wearing a certain piece of clothing may wear that piece of clothing in future games because it "brought him good luck."

Several traditional criteria for good analogical inference are best understood as amplifications of this weak appeal to mere similarity. Copi (1986, pp. 411–414), for example, treats arguments by analogy as a species of inductive argument, by which

he means an argument intended merely to support its conclusion as probably true. The more sources appealed to, the more similarities between sources and target, the fewer dissimilarities between sources and target, and the more dissimilar the sources are to each other, he claims, the more probable does the conclusion of an analogical argument become. We can see why these claims would be true of any universe in which properties sometimes cluster together. A large number of sources increases the probability that the predictor properties and the queried property form a genuine cluster, not just a chance coinstantiation. A large number of similarities and a small number of dissimilarities between sources and target both decrease the probability that some feature that the target does not share is responsible for the sources' possessing the queried property. The dissimilarity of the sources to each other also decreases the probability that some common feature not shared by the target is responsible for the sources' possessing the queried property.

12.4 Determination-Based Criteria for Good Analogical Inference

The standard response to the weakness of mere similarity as a basis for analogical reasoning is to impose an additional requirement of relevance: similarities must be relevant to the queried property in order to justify projecting it from the sources to the target. Copi (1986), for example, cites such relevance as the most important of his six criteria for evaluating analogical inference. Since sources necessarily differ in some respects from the target, the concept of relevance also imposes some constraint on which differences can count against the target's possession of the queried property: they count negatively only if the property possessed by the source (s) but not by the target is relevant to possession of the queried property. A target which is both relevantly similar to and relevantly different from some source(s) can be justifiably concluded to possess the queried property only if the relevant similarities outweigh the relevant dissimilarities. The justification in such cases is taken to be defeasible, such that the conclusion may need to be revised if further evidence comes to light, even though the premisses of the analogical reasoning remain warranted.

This account makes a neat package, but it needs explication. What does it mean to say that possession of a given property is relevant to possession of another property? How is the strength of a relevance relation weighed so as to determine whether relevant similarities outweigh relevant dissimilarities?

Copi tells us confidently (1986, p. 413) that "it is doubtful that there is any disagreement about the *meaning* of relevance" (his emphasis; the contrast is to disagreement about what attributes are relevant).

> An analogy is relevant to establishing the presence of a given attribute…provided that it is drawn with respect to *other circumstances affecting it.* One attribute or circumstance is

> relevant to another, for purposes of analogical argument, if the first affects the second, that is, if it has a *causal* or determining effect on that other. (p. 414)

Copi amplifies this account by allowing that analogical arguments are highly probable also when they go from effect to cause and even when they go from effect to another effect of the same cause.

A difficulty with Copi's position is that it fails to cover cases where the relevance of the predictor properties is not causal but what we might call constitutive: the predictor properties constitute, partly or fully, the queried property, which is supervenient on those properties (and perhaps some others). Such a relationship appears in cases of legal, moral, or philosophical reasoning by analogy where the conclusion is an evaluation, deontic statement, or classification of the target case. It would be odd to say that certain features of a contemplated action caused it to be morally permissible. Certainly it would not be true to say of such connections, as Copi says of the connections which justify causal relevance, that they "are discovered only empirically, by observation and experiment" (1986, p. 414).

If there is to be a single general formula covering both causal relevance and these other sorts of relevance, we might be tempted to express it by saying that the predictor properties are relevant to the possession of the queried property if and only if cases having the predictor properties either always, mostly, or provisionally have the queried property. But such a relevance condition would undermine reasoning by analogy, for it would make appeal to the source cases probatively unnecessary. They could have at best a mnemonic function of reminding the audience of the justifying covering generalization. Keynes (1921), Nagel (1961) and others argued for precisely this reason that arguments by analogy are useless for proving anything, since they are sound only if we have background knowledge that every case with the predictor properties has the queried property, in which case information about the source cases is logically irrelevant.

A second reflection on the construction of a covering generalization for arguments by analogy, however, may point to a type of background knowledge that would not make the appeal to sources in such arguments redundant. As I mentioned above, substitution on a repeated content expression in an argument with a good inference may be restricted to a subcategory within which the expression falls. If the expressions in arguments by analogy that refer to predictor and queried properties are to be treated as subject to substitution, is there some way of restricting substitution on them to a subcategory? We note that the properties signified by such expressions come in sets, each of which we might call a variable; a case has exactly one value of any such variable. Thus, for example, blue is a color, a sixty-five-thousand-dollar selling price is a selling price, and so on. So, if we restrict substitution to other values of the same variable, we could express a more restricted condition for good analogical inference as follows:

> If a target case has the same values of the predictor properties' variables as the sources, and the sources have the same value of the queried property's variable, then the target has this value of the queried property's variable.

In other words, the values of the variables of the predictor properties determine the value of the variable of the queried property.

This sort of determination relation has been explored in detail in recent work in artificial intelligence (Davies 1988). Such a relation is sometimes known, renders the argument by analogy for which it is the covering generalization valid, and yet does not make redundant the premiss that appeals to the experience of the source cases. A simple example of a determination relation is that in Canada the first letter of a postal code for a given address determines the province in which that address is located. We could express this relation in the form of the above general schema for determination relations as follows:

> If a Canadian address has the same first letter in its postal code as a number of other Canadian addresses, and those other addresses are in a certain province, then the first address is in the same province.

Note that this determination relation could be known even if one did not know the province determined by a specific initial letter, say, S. (Indeed, if one knew the actual allocation of first letters to provinces in the Canadian postal code system, one would not resort to analogical inference; operating in the presence of incomplete background theoretical knowledge is typical of reasoning by analogy.) In order to determine the province in which a target address whose postal code began with an S was located, it would suffice to know the province of some source address whose postal code also begins with an S. In such a context, information about the source would not be redundant.

An interesting feature of this type of argument is that it is, in our terminology, materially or enthymematically valid. That is, given the determination rule that licenses the inference by analogy, the truth of the premisses guarantees the truth of the conclusion. In such cases, reasoning by analogy is not provisional or probabilistic, as it usually is, but quite tight. Another interesting feature is that none of the similarity-based criteria make a difference to the goodness of the inference. One source is enough, as is one similarity between source and target; if there are several sources, it makes no difference how dissimilar they are in other respects.

A real-life common example of reasoning by analogy based on a somewhat looser determination relation is real estate appraisal. The task of a real estate appraiser is to determine the current market value of a piece of real estate, say a house. One way to do so, widely accepted as reliable, is to find a number of comparable houses that have sold recently, and to project the sale price of those sources onto the target case. An appraiser might regard as relevant factors (that is, variables, in our current terminology) the neighborhood, lot size, frontage, zoning, square footage of the house, number of bedrooms, number of bathrooms, condition of the home, date of sale, and so forth. Because it is recognized that many factors influence the price at which a house sells, including some that have nothing to do with its intrinsic characteristics or the time at which it is sold, the sale price of comparable houses can provide only a rough guide to the market value of the target case. Hence, the more comparables, the better. (Again we see reasoning by analogy operating on the basis of weak theory; there is no well-substantiated theory of real

estate prices enabling one to infer its market value from its intrinsic characteristics and the date.) The covering generalization with which real estate appraisers work would therefore look something like this:

> If a-number of houses comparable to the target house (in neighborhood, lot size, frontage, zoning, home size, number of rooms, home condition, and so forth) have recently sold on average for a certain price, then the current market value of the target house is (probably) approximately that price.

We could express the general condition for "validity" of arguments by analogy of this type as follows:

> If a target resembles a number of sources in having the same values of a specified set of variables, and the sources have roughly the same value as another specified variable, then the target will probably or provisionally have roughly that value of the other variable.

Or, more simply, the values of the predictor properties' variables determine the value of the queried property's variable.

In principle, this theory of determination relations as the warrant for reasoning by analogy could apply equally well to the non-inductive arguments by analogy identified by Levi (1949) and Wisdom (1991). In a civil suit in which one corporation sues another for misappropriating trade secrets, whether the information counts for legal purposes as a trade secret may be determined by such factors as whether the plaintiff disclosed it to outsiders, whether the plaintiff imposed restrictions on disclosing it to outsiders, how many outsiders the plaintiff disclosed it to, whether the plaintiff took measures to keep the information secure, and so forth. Ashley (1988) has used such information, gathered from legal treatises and articles, to construct a program which, given the facts of a hypothetical target case expressed in a legal-case-frame language, will go through an adversarial reasoning process with reference to real legal precedent cases and come up with an overall evaluation of the various arguments by analogy that can be deployed concerning the hypothetical case. (Here again, there is only weak theory to go on. The law does not define precisely what counts as a trade secret, and the accumulation of precedents never amounts to a complete determination of such a concept.)

Ashley's program, called HYPO, models well the adversarial process in which attorneys for the two sides analogize the case under consideration to precedents that favor their side and distinguish it from precedents that favor the other side. It provides a partial adjudication procedure in cases where only one side can cite precedents for which there are no counterexamples closer to the target case (in terms of the relevant variables). And it models the judgment involved in judicial decision making by coming to no conclusion when both sides (or neither side) can cite such "untrumped" precedents. Its weakness, however, is that it works from a knowledge base in which the relevant features of the precedents are antecedently identified. In legal reasoning, as Levi (1949) and others have pointed out, lawyers and judges habitually redescribe precedent cases so as to make them more or less distinct from a target case under discussion.

12.5 Criteria for Good a Priori Analogical Inference

What seems to happen in such appeals to precedent is that the very consideration of the precedents leads to the covering generalization, even when there is only one precedent. Such generalization from single cases occurs also in moral casuistry. Thomson's consideration (1971) of the hypothetical case of the unconscious violinist is a good instance. Imagine, she says, that you wake up one morning back to back in bed with an unconscious violinist. The violinist is suffering from a fatal kidney ailment and the Society of Music Lovers, having discovered that you alone have the right blood type to keep him alive, have kidnapped you and plugged his circulatory system into yours. If unplugged, he will die. The hospital director explains to you that, although you have a right to decide what happens in and to your body, the violinist has a right to life, which outweighs your right, so the violinist must remain plugged into you.

Thomson takes it that her readers will immediately see that the hospital director's argument is outrageous, because it falsely assumes that a right to life always outweighs a right to decide what happens in and to one's body. She can then project to her target—the standard argument for the moral impermissibility of abortion—the generalization that any argument which makes this assumption is flawed.

On an account like Ashley's, Thomson would be taking advantage of an antecedently conceded relationship between whether an argument assumes that a right to life outweighs a right to bodily integrity and the quality of that argument. But she is doing no such thing. She is arguing dialectically against opponents of abortion who, antecedently, concede no such relationship. In fact, she takes them to assert the opposite relationship. So the point of the analog argument about the unconscious violinist is to bring home to the reader the very relationship that licenses the transition from that case to Thomson's target.

What shall we say about the legitimacy of such a move? It is clearly not a valid way of establishing an empirical claim, a prediction. For, in the absence of some antecedently known covering generalization (such as a determination relation) or background theory, a single instance will not justify a generalization from it. But normative and classificatory claims seem to be justifiable in this way. Is the fact that a student does not benefit from a certain action relevant to whether it is an act of academic dishonesty? No, someone might argue, because a student who steals a copy of an exam has still acted dishonestly even if he is found out and the exam changed. Here we recognize in a single case the irrelevance of a certain factor to the classification of an action as one of academic dishonesty.

Wisdom has argued at length (1991) for the legitimacy of a distinctive form of argument by analogy based on such insights. His argument for the sometime legitimacy of proof by parallels or reasoning by a priori analogy seems compelling. From the point of view of our general theory, however, such arguments pose a difficulty. The covering generalization that would license the inference from the source to the target is not known independently of the premiss concerning the source. Our conception of what makes an action dishonest, or a piece of information

a trade secret, or an act of bringing about one person's death which also saves the lives of several others morally permissible (Thomson 1985) is not antecedently fixed. In picking a source that has certain affinities with and dissimilarities from the target, we implicitly form a judgment about the features of the source in virtue of which it possesses the queried property and the features that are irrelevant to having the queried property. But this judgment may not be reached, or reachable, independently of consideration of cases that can serve as sources. If so, we may perhaps represent the form of an a priori argument by analogy as follows:

> The sources have the queried property by virtue of the predictor properties.
>
> The target has the predictor properties.
>
> Therefore, the target has the queried property.

Here the first premiss is justified by direct inspection of the individual case(s), a procedure which is fallible and in any case has merit only where the queried property is supervenient. (We cannot get insight into causal connections by direct inspection of one individual case.) Where the queried property is supervenient, conjectures as to the features responsible for its presence in clear-cut cases can be tested by a method of attempting to construct hypothetical cases that have those features but clearly do not have the queried property. For a good example of this method, see Thomson (1985).

If we construe a priori arguments by analogy as suggested above, then we can state the condition for their validity in the form of a restricted covering generalization:

> If some cases-have a queried supervenient property by virtue of certain features, then any case with those features provisionally has that property.

This statement seems to me to be true, and thus to indicate that the conclusions of arguments by a priori analogy can follow provisionally.

12.6 Summary and Conclusion

In arguing by analogy, we project a queried property from source cases that share certain features (predictor properties) to a target case that also has those features. Such projections are sometimes legitimate, even where we lack antecedent knowledge that any case with the predictor properties also has the queried property.

The strongest legitimation for such inferences is the existence of a determination relation according to which the variables of which the predictor properties are values determine the variable of which the queried property is a value. If such determination relations are tight and exceptionless, they legitimate conclusive analogical inferences. If they are loose, they legitimate only probable or provisional analogical inferences.

Such determination relations hold mainly for what have been called inductive arguments by analogy (Barker 1965), where the conclusion is a statement of fact

that can in principle be empirically tested independently of the analogical argument. But a moral or legal tradition may be sufficiently worked out in some respects to ground a determination relation between certain variables and a normative, evaluative, or classificatory variable, as in the case law on trade secrets discussed above.

More commonly, sound analogical inferences to a recommendation, evaluation, or classification rest on an insight into the relevance of the predictor properties to the supervenient queried property, an insight which may require only one source case to substantiate. In such inferences the premiss is not merely that the source has both the queried property and the predictor properties, but that the source has it by virtue of those predictor properties; in Judith Thomson's memorable example, the hospital director's argument is outrageous because it assumes that a right to life always outweighs a right to decide what happens in and to one's body. Given such a premiss, the conclusion follows, usually, provisionally.

The weakest form of analogical inference is one where there is no known determination relation and no insight into the supervenience in the source cases of the queried property on the predictor properties. Here the sorts of similarity-based criteria advanced by Copi (1986)—greater numbers of sources, more similarities and fewer dissimilarities between the sources and the target, dissimilarities in other respects among the sources—can raise the inferential connection to one of weak probability. Such similarity-based criteria can also increase the confidence and precision of loose determination and supervenience relations. But, without such a relation, inference by analogy is risky. It would be wise to take it as probative only under extreme circumstances for pragmatic reasons.

The fact that these sorts of good analogical inference fit my general theory of good inference provides some support for that theory. We should now be a little more inclined to accept the suggestion that an argument has a good inference if and only if it contains one or more repeated content expressions on which uniform substitutions within a category or subcategory either always, mostly, or provisionally make the conclusion true when they make the premisses true.

The criteria for good analogical inference, although disjunctive and more specific than the general theory, nevertheless straddle fields. Analogical arguments for the existence of God belong to a different field than analogical arguments about the stopping distance of a car or the province in which a certain address is located. But all these arguments are best appraised by determination-based criteria. Naturally, the specific content of the determination relation will vary from one argument to another, and working out whether it holds will require knowledge of the field of inquiry to which the subject matter of the argument belongs. But the general strategy of identifying the variables to which the predictor properties belong, and thinking about whether those variables determine the variable to which the queried property belongs, is common. Likewise supervenience-based criteria for analogical inference straddle at least moral and legal reasoning, and perhaps other fields as well. Thus epistemological subject specificity fails for the critical thinking skill of evaluating analogical inference; the criteria for good analogical inference are not entirely field-specific.

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Chapter 13
Pollock on Practical Reasoning

Abstract The American epistemologist John Pollock has implemented computationally an architecture for a rational agent which he calls OSCAR. OSCAR models both practical and theoretical (or epistemic) reasoning. I argue that Pollock's model of practical reasoning, which has seven components, is superior not only to the two-component belief-desire model stemming from Aristotle, but also to the three-component belief-desire-intention model developed especially by the contemporary American philosopher Michael Bratman. Despite its advantages, Pollock's model of practical reasoning is incomplete in at least three respects: it is solipsistic, it is egoistic and it is unsocial.

13.1 Introduction: The Nature of Practical Reasoning

By "practical reasoning" I shall understand reasoning about what to do. Practical reasoning is to be contrasted with reasoning about what to believe, which is often called "theoretical reasoning", but which I shall here call "epistemic reasoning", following Pollock (1995, p. 9). Doing something includes as the most elementary case (1) a simple physical action, such as raising one's arm. More complex cases are (2) a series of physical actions and (3) adoption of an intention to perform some action later (a "plan", which may be only partially elaborated at first). Typically the actions to be performed will not be described in terms of how the agent moves the parts of its body (and indeed it may be somewhat indeterminate what bodily movements will constitute the action), but rather in terms of what function the movement of the parts of the body will amount to, e.g. calling someone on the

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telephone and asking them a certain question. (4) Plans may be logically complex, including for example disjunctions or conditions. (5) More general than a plan is a policy, which is the carrying out of a certain type of plan whenever specified conditions obtain (e.g. whenever I want to walk across a street, do so only when it is safe). More complex still are (6) cases where the agent is not an individual human being but an organization of human beings—an academic department, a municipal government, the board of directors of a joint-stock company, the executive of a voluntary organization, etc. Actions of all these types include intentional omissions, i.e. intentionally not initiating (now or later) a certain bodily movement or series of bodily movements, defeating a resolution to undertake some initiative, etc. Thus, generically, practical reasoning is reasoning directed to the adoption of a policy by some agent, where policies include as limiting cases plans (policies adopted for just one occasion) and actions (plans with only one component), and the agent adopting the policy may or may not be identical to the set of individuals carrying out the reasoning.

On the face of it, the criteria for good practical reasoning must be different from those for epistemic reasoning. For we evaluate the inferential link in epistemic reasoning by considering how likely it is that the conclusion is true if the premisses are true: the inference is deductively valid if it is necessary that the conclusion is true if the premisses are true, inductively strong if it is probable that the conclusion is true if the premisses are true, and provisionally valid if ceteris paribus the conclusion is true if the premisses are true. But the conclusion of practical reasoning is a policy decision, which is not the sort of thing that can have a truth-value. Policy decisions can be wise or foolish, far-sighted or short-sighted, and so on, but they cannot be true or false. There is no such thing as a true policy or a false policy. One can attempt to assimilate the imperative conclusions of practical reasoning ("Let's invite them to dinner next Saturday") to the indicative conclusions of epistemic reasoning by recasting those imperative conclusions as indicative "ought" statements ("We ought to invite them to dinner next Saturday"). But this assimilation will not work, for two reasons. First, it is doubtful that "ought" statements have truth-values. If we adopt a reistic conception of truth according to which any true assertive is true in virtue of some truth-maker, such as a fact or an event or a state of affairs, then we are faced with the problem of finding a truth-maker for supposedly true "ought" statements. In virtue of what state of affairs could it be true that we ought to invite some friends for dinner next Saturday? Empirical investigation can discover facts relevant to our decision-making—for example, that we have not seen these friends for some months and that our calendar is empty for that day. But it cannot discover that we ought to invite them for dinner. If there is a fact that we ought to invite our friends for dinner, it is a queer sort of fact indeed. More likely, there is no such fact, and it is not true that we ought to invite our friends for dinner.[1]

[1] *Added in the present republication*: There continues to be debate in moral philosophy about whether moral judgments, including moral 'ought' judgments, have truth-values, and if so what makes them true or false. The debate would presumably apply as well to such non-moral 'ought' judgments as the judgment that one ought to invite one's friends for dinner.

Which is not to say that there is the opposite fact that it is not the case that we ought to invite our friends for dinner; there is no such opposite fact, and it is not true that it is not the case that we ought to invite our friends for dinner. Second, and more decisively, it is always possible without contradiction to affirm an "ought" statement and make the opposite policy decision. We can consistently say, for example, "We ought to invite our friends to dinner next Saturday, but let's not." "Ought" statements are not the same as policy decisions.

13.2 The Belief-Desire Model of Practical Reasoning

The simplest model of good practical reasoning is the belief-desire model first articulated by Aristotle. According to the model prescribed in his *Nicomachean Ethics* (Aristotle 1984, III.3.1112b15-20), good deliberation begins with a wish for some end. The practical reasoner then considers how this end is to be attained. Having found a means of attaining it, the reasoner then considers how this intermediate end is to be attained, and so on until some means is discovered which is an action within the person's power. The conclusion of the reasoning is a decision to perform this action, which in Aristotle's model immediately issues in the action itself. If at any stage the agent discovers more than one means of achieving a desired end, the agent looks for the easiest and finest of them; thus Aristotle incorporates considerations of efficiency and nobility in his model. For other descriptions of practical reasoning as a process of reasoning from a desire for some end via beliefs about the means of achieving it, see *On the Soul* III.10.433a13-20, *Nicomachean Ethics* VI.2.1139a32-b5, and *Eudemian Ethics* II.10.1227a2-30 (Aristotle 1984). A variant formulation holds that practical reasoning combines a universal judgment about what ought to be done (e.g. that everything sweet ought to be tasted) with a particular judgment or judgments bringing the present situation of the agent under the universal judgment (e.g. that this is sweet); see for example *On the Soul* III.11.434a17-19, *Movement of Animals* 7.701a7-24, and *Nicomachean Ethics* VII.3.1147a25-31 (Aristotle 1984). This variant can be assimilated to the means-end model by allowing an end to be achieved in the very performance of an action; for example, eating a particular piece of chocolate could be construed as a means of attaining the generic end of tasting something sweet. The universal "ought" judgments in the variant model must be construed as expressions of a desire, in order to make the variant model consistent with Aristotle's repeated claim that practical reasoning requires a desire for some end to initiate it.

The classic modern statement of the necessity of desire for practical reasoning occurs in David Hume's *Treatise of Human Nature* II.3.3. In Hume's famous words,

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(Footnote 1 continued)

Alternatively, one could treat 'ought' statements as supervenient on factual claims and hold that they are true if the factual statements on which they supervene are true.

"Reason is, and ought only to be the slave of the passions." Passions always involve desires, which are the initiator of practical reasoning; neither abstract reasoning nor inductive reasoning about causes and effects can by itself initiate action. Passions are unreasonable only when they are founded on a false supposition or choose a means insufficient for the desired end. Nothing enters into practical reasoning but a desire for some end and beliefs about the means of achieving it.

13.3 The Belief-Desire-Intention (BDI) Model of Practical Reasoning

Among contemporary philosophers, Bratman (1987) has made a new contribution to the traditional model of practical reasoning by arguing convincingly for a third component: intentions, which are paradigmatically future-directed. The traditional model explained intentions adverbially: to do something with an intention to do it is to do it intentionally, where doing something intentionally is construed as doing something in terms of the agent's desires and beliefs. Intentions to do something in the future were reduced to appropriate desires and beliefs. Bratman resists this reduction. To form an intention to do something in the future, he argues, is to adopt a plan, which typically is partial. Human beings, unlike many nonhuman animals, are planning agents; they need to adopt plans for the future in order to allow their reasoning about what to do to reach beyond the present moment and to coordinate their activities with each other and with those of other people. We do not do justice to this important aspect of human rationality if we treat future-directed intentions as a mere construct of present desires and beliefs. Rather, we need a planning theory of intention which articulates the regularities and norms in virtue of which intentions are a mental attitude distinct from desires and beliefs. Intentions are an output of practical reasoning, and also an input to future practical reasoning, in the form for example of a constraint on admissible options. In later work, Bratman (1999) has fleshed out his original theory, for example in a discussion of when it is rational to reconsider previously adopted plans.

The belief-desire-intention (BDI) model of practical reasoning has been implemented in a number of computer-based decision support systems.

13.4 Pollock's Belief-Desire-Intention-Liking (BDIL) Model of Practical Reasoning

Pollock (1995) incorporates Bratman's intentions, but adds a new type of component to practical reasoning, which he calls "likings". Furthermore, he distinguishes two types of likings and three types of desires, which in combination with beliefs and intentions produce a seven-component model of practical reasoning.

Situation-likings are fundamental. The function of rationality, Pollock supposes, is to make the world more to its possessor's liking. Hence a rational agent must have a way of telling how likable a situation is—a feeling produced by the agent's situation as the agent believes it to be. Humans are introspectively aware of such feelings.

Intentions encode the adoption of a plan. Planning involves constructing or discovering courses of action that might lead to the world's being more likable than otherwise. A rational agent will adopt a plan whose expected situation-liking is determined by deliberation to be at least as great as that of any of the competing plans under consideration. Ideally, a rational agent choosing among plans would consider each possible outcome of implementing each plan, estimate the probability of each such outcome given adoption of the plan, evaluate how likable that outcome would be, and adopt a plan whose weighted average of outcome likability was no lower than that of any other plan under consideration. A possible outcome is a type of situation characterized by certain features, whereas an agent's primitive likings and dislikings are for situation-tokens; the likability of a possible outcome is thus an expected likability, a weighted average of the likability of token situations of that type. To arrive at such an expected likability requires a cardinal measure of the likability of token situations. Pollock proposes to construct a cardinal measure indirectly, on the basis of a "quantitative feel" of a comparative preference relation among four arbitrarily chosen situations; he thinks that humans can introspectively tell whether they prefer situation B to situation A more than they prefer situation D to situation C. Further mathematical manipulation, combined with some assumptions about the preference relation, will produce from these data a cardinal measure allowing for unique comparisons of expected likabilities.

Feature-likings are a shortcut required by constraints of time and resources. Theoretically, a rational agent could work out by reasoning what features of situations are causally relevant to their being liked or disliked. In practice, the agent has to act before having time to go through the elaborate reasoning that would be required (and to accumulate the experience needed as inputs to such reasoning). Hence a rational agent needs Q&I (quick and inflexible) modules which provide this information. Pollock speculates (1995, p. 20) that humans acquire feature-likings through their ability to imagine situations (which must be types rather than tokens) and respond conatively to them; equally speculatively, we can conjecture that humans recognize directly in a token situation those aspects of it which they like or dislike—but perhaps what appears to be immediate recognition is a product of learning. Parenthetically, Pollock notes that there could be a rational agent for whom feature-likings are fundamental; such a rational agent would need, Pollock argues, both a cardinal measure of primitive feature-likings and a way of computing a liking for combinations of features from the likings of individual features (1995, pp. 20–21). Humans seem to use Q&I modules to compute the comparative expected value of plans on the basis of situation-likings and feature-likings; Pollock thinks that artificial rational agents might be able to solve the integration problems required for this computation explicitly.

Primitive desires encode goals and initiate planning. Goals, construed as combinations of features, are required for planning by limitations of time and resources.

Starting with a specific goal is necessary for efficient interest-driven epistemic reasoning, as opposed to a time-consuming random generation and evaluation of plans. A plan which can attain a goal can be presumed to have a positive expected value if the expected likability of the goal's combination of features is greater than the expected likability of the situation that would otherwise result. But this presumption can be defeated by other features of the situation that results from carrying out the plan. Considerations of feasibility require that a rational agent not only form desires as a result of epistemic reasoning about the expected likability of certain combinations of features, but also have Q&I modules which propose goals and produce their default adoption, unless the agent's reasoning judges them unsuitable. Humans have such optative dispositions to try to alleviate hunger, avoid pain and pursue pleasure. Conditioning can lead to new optative dispositions. In a fully practically rational agent, reasoning that a desired goal is unsuitable would extinguish the desire, and reasoning that a goal is suitable would produce a desire for it; Pollock notes drily (1995, pp. 27–28) that humans are not fully rational in either of these respects.

Instrumental desires are produced by adoption of a partial plan (for example, getting this paper to the editor of the issue in which it appeared by the promised deadline as a way of achieving the goal of his including it in the issue); such desires initiate further planning.

Present-tense action desires are needed to initiate action, since adopted plans may leave the scheduling of steps indefinite. Action-initiating desires may be produced by optative dispositions or by the adoption of a plan. When present-tense action desires conflict, an agent will act on the strongest of these desires. Thus a rational agent will proportion the strength of such a desire derived from an adopted plan to the expected likability of the tail of the plan, that part of it which remains to be carried out. Pollock seems to assume that the strength of desires produced by optative dispositions (e.g. a human being's disposition to try to alleviate its hunger) will also be proportional to the expected value of satisfying them, because he thinks a rational agent should at any given time perform the action it most wants to perform (1995, p. 31). But this assumption seems implausible; a human being may for example have a fierce desire to drink or eat what is in front of him or her and a weak desire to postpone the satisfaction of this desire (for example in an extreme situation where survival requires rationing a limited supply). There seems to be a need in a fully practically rational agent to override a strong present-tense action desire due to an optative disposition in the light of a rationally based judgment that some alternative action has greater expected value; Pollock (1995, p. 35) seems to assume that such reasoning would dispel the suboptimal desire in a fully rational agent, but overriding it would also seem to be rational.

13.5 Strengths of Pollock's BDIL Model

A great strength of Pollock's model is its recognition that desires are not the ultimate canon of appeal in practical reasoning. Contrary to Hume, a desire can be subject to rational criticism, on the ground that satisfaction of the desire will produce a situation less to the agent's liking than some alternative option. This point is a matter of common sense once it is articulated; it is implicit, for example, in the common recognition that people in the grip of a harmful addiction would be better off if they did not have the desire for the addictive experience. Addicts often recognize this fact themselves. Philosophical theories of practical reasoning, perhaps under the influence of Hume, have tended not to allow for it. They have recognized that pleasant and painful experiences cause desires and aversions; see for example Aristotle's *On the Soul* III.7.431a8-10 (Aristotle 1984) and Hume's *Treatise* II.3.3 (1975, p. 414). But Hume in particular left no room for the rational assessment of desires according to the pleasure to be gained from satisfying them. (Aristotle does have a theory of correct and incorrect desires, but exploration of his theory would take us too far afield.)

A further strength of Pollock's theory is his use of the degree to which a token situation is likable as the ultimate touchstone of practical reasoning, rather than appealing to how pleasant or painful the situation is to the agent. Pollock's formulation is better in two respects. First, the concepts of pleasure and pain are too easily construed simply in terms of gratification of the appetites connected with the senses of touch and taste. Such comforts and delights are certainly some part of living a good life, but they are not the whole of it. As John Stuart Mill memorably put it, "I had rather be Socrates dissatisfied than a pig satisfied." (Mill 1888) A Pollockian rational agent would express the point in terms of likings rather than preferences: I would like it more if I were Socrates dissatisfied than if I were a satisfied pig. Pollock's theory, unlike Mill's, does not prescribe any particular hierarchy of situations. But, in taking personal situation-likings as basic, it allows each agent to accommodate the preference expressed by Mill. Second, Pollock's theory appeals not to how much an agent actually likes a token situation but to how much the agent would like the situation if the agent's relevant beliefs were correct. Thus token situation-likings become subject to rational criticism in terms of the correctness of the beliefs which produce them. Recognition of this sort of rational criticism in a theory of practical reasoning is not new; even Hume acknowledged it, in his case with reference to "passions", i.e. desires. But it is less common to allow it in a theory which takes as basic some analogue to Pollock's situation-likings.

Another strength of Pollock's model is his recognition that a rational agent operating in real time in a hazardous environment with quite limited computational resources needs quick and inflexible (Q&I) modules to generate actions by default in many situations. Without the reflex reaction of withdrawing one's hand immediately from painful contact with a flame or similarly hot object, human beings would find the world much less to their liking than they now do. Similarly with the inclination to eat when one feels hungry. A well-designed rational agent needs

however to be able to override such Q&I modules if reasoning indicates that it would be better to do so.

As Pollock himself points out (1995, pp. 34–35), all kinds of evaluative attitudes other than situation-likings are subject to evaluative rational criticism, i.e. to criticism which is not a criticism of any beliefs on which they rest. Instrumental desires can be criticized by evaluating the plan from which they are derived. Primitive desires, whether produced by optative dispositions or by ratiocination, can be criticized on the ground that the goal they encode does not have a high relative expected value. Present-tense action desires can be criticized (if they arise from adoption of a plan) by evaluating the plan from which they are derived or (if they arise from an optative disposition) by arguing that fulfilling them does not contribute to living a good life, in the sense of a life in which the agent's situation-tokens are more likable than otherwise.

Further, as Pollock also points out, not all reasoning is epistemic; here he explicitly dissents from Hume. Pollock's model includes three types of non-epistemic state transitions which are subject to rational evaluation: (a) from beliefs about the expected situation-likings of potential goals to desires (adoption of goals), (b) from beliefs about the relative values of plans to intentions (adoption of plans), and (c) from choosing the strongest present-tense action desires to actions.

13.6 Weaknesses of Pollock's BDIL Model

An obvious objection to Pollock's model is that it requires a cardinal measure of situation-likings. While one can assign such numbers to a computational simulation of a rational agent, human beings clearly do not consciously associate with their awareness of their present situation some number which measures how much they like it. Pollock does suppose, quite plausibly I think, that human beings have a "quantitative feel" (1995: 17) for how much they like a given situation that permits a certain comparative ordering. Consider any four token situations in which you have found yourself. Assign to them the labels "a", "b", "c" and "d" in such a way that you liked situation a more than you liked situation b, and you liked situation c more than situation d. Then you should be able to tell whether the first difference in liking was greater than, equal to or less than the second difference in liking; letting "fx" stand for "the likability of x", you might find that $(fa - fb) > (fc - fd)$. So far so good. But, in order to use such orderings as the basis for a cardinal measure of situation-likings, Pollock needs to make further rather complicated assumptions. (Pollock 1995, p. 18 n. 13) It is doubtful whether such assumptions are justified.

Further, Pollock's model is incomplete in at least three important respects.

First, it is solipsistic, in the sense that there is no provision for verbal input from, or verbal output to, other autonomous rational agents, still less for back-and-forth discussion, whether argumentative or non-argumentative.

Second, it is egoistic, in that the function of the entire system is to make the world more to the liking of that system itself, without regard (except instrumentally)

to whether its actions make the world more or less to the liking of other systems which have situation-likings and situation-dislikings. In calling Pollock's model egoistic, I do not mean to imply that the situation-likings which are at its basis have reference only to how the agent is faring. An agent might well find one situation less likable than another only because someone else is worse off in the former situation. Most parents of small babies, for example, would find a situation more likable if the baby was healthy than if it was sick, quite apart from any inconveniences to themselves. But the relevance of the baby's situation to the practical reasoning of the parent is on Pollock's model a function only of the parent's likings. If the parent was indifferent between the health and the sickness of the baby, nothing in Pollock's account permits rational criticism of this indifference. It is in this sense that Pollock's model is egoistic. Morally speaking, Pollock's "rational agent" is a monster.

Third, Pollock's model is unsocial, in that his rational agent does not (and cannot) belong to any groups of autonomous rational agents with governance structures for making decisions about the actions of the group; it is a citizen of no country, belongs to no professional associations, owns no shares in any joint-stock company, has no immediate family, does not belong to a recreational bridge-playing group, etc.

A comprehensive theory of good practical reasoning would have to remedy all three of these lacks.

13.7 Conclusion

Pollock's model of practical reasoning has been computationally implemented in a comprehensive architecture for a rational agent which he calls OSCAR (Pollock 2013). His work illustrates a great advantage of computationally implementing philosophical theories: it brings to the fore new questions which were previously neglected. In the case of OSCAR, these include the need for Q&I modules, the necessity for a control structure for engaging in practical reasoning and the need to be able to override Q&I modules in the light of reflective reasoning. The need to design a system which combines epistemic and practical reasoning has produced a model of practical reasoning which is much more sophisticated and complex than anything previously produced. In particular, Pollock has made a strong case that practical reasoning requires not only the beliefs and desires which theorists of practical reasoning have required for millennia, and not just the additional distinct category of intentions for which Michael Bratman has argued, but also likings. And he has shown how a variety of transitions between mental states of these types are subject to rational criticism. At the same time, his model is incomplete in not allowing for communication between rational agents, social cooperation and the recognition of moral constraints. These three lacks are obviously interconnected.

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Chapter 14
The Generation of Argument Schemes

Abstract One can generate argumentation schemes in three ways. A bottom-up approach of extracting patterns of argument from a corpus of actual arguments can be somewhat arbitrary, and is likely to produce an unsatisfactory guide to understanding and evaluating arguments. A top-down approach starting from taxonomies of statements and rules of inference risks a combinatorial explosion of abstract unrealized possibilities. A combined approach is more useful.

14.1 Introduction

Doug Walton's work on argumentation schemes is one of his central contributions to the theory of argumentation. His co-authored *Argumentation Schemes* (Walton et al. 2008) includes (pp. 308–346) a "user's compendium" of 60 argumentation schemes, some with alternative versions or sub-schemes. Most come with associated "critical questions" and references to publications, most by Walton himself, where the scheme is discussed in detail. Notably, Walton's *Argumentation Schemes for Presumptive Reasoning* (Walton 1996) describes and analyzes (pp. 46–110) 25 argumentation schemes that Walton takes to involve what he calls "presumptive reasoning", defined as a tentative sort of reasoning that in a dialogue shifts a "weight of presumption" from the proponent of a thesis. The opponent can shift the weight of presumption back by asking a "critical question" associated with the scheme implicit in the proponent's argument. The proponent can in turn shift the weight of presumption back again by giving a satisfactory answer to the question. And so on (Walton 1996, p. 46).

An argumentation scheme is a pattern of argument, a sequence of sentential forms with variables, with the last sentential form introduced by a conclusion indicator like 'so' or 'therefore'. The scheme becomes an argument when each

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variable is replaced uniformly at all its occurrences with a constant of the sort over which the variable ranges. A simple example is the pattern, 'x is human, so x is mortal', which becomes the argument 'Socrates is human, so Socrates is mortal' when the variable 'x' ranging over names and definite descriptions is replaced with the name 'Socrates'. As far as we know, this simple argumentation scheme is valid, in the sense that it is impossible for the conclusion of an argument fitting the scheme to be untrue while its premiss is true; the impossibility, we might suppose, is physiological rather than semantic. The argumentation schemes identified by Walton and others are at a higher level of abstraction, but not so abstract that they become purely formal schemes like the valid scheme for *modus ponens* arguments: 'If p then q; and p; therefore q'. At the intermediate level of abstraction typical of Walton's argumentation schemes, arguments fitting a given scheme sometimes have a good inference from premiss(es) to conclusion and sometimes do not, depending on whether certain conditions are met. For example, arguments fitting the generic composition scheme, 'All the parts of x are F; therefore, x is F' (Walton et al. 2008, p. 316), are valid if and only if the variable ϕ of which F is a value is compositionally hereditary with respect to some kind K of aggregate to which x belongs, in the sense that, when all the parts of an aggregate of kind K have the same value of the variable ϕ, then so does the whole aggregate. As an aid to evaluation of the inference in an argument fitting a certain scheme, the theorist will provide a list of so-called "critical questions" to be asked, corresponding to the conditions under which arguments of the scheme in question have a good inference. In the case of generic composition arguments, there is a need for just one such critical question: Is the variable of which F is a value compositionally hereditary with respect to some kind to which the aggregate x belongs? In the case of the argument, 'All the parts of this chair are brown, so the chair is brown', the answer is positive, since colour is compositionally hereditary with respect to articles of furniture. But the answer is negative for the argument, 'All the parts of this chair are small, so the chair is small', since size relative to some fixed benchmark is not compositionally hereditary with respect to physical objects.

Where do these argumentation schemes come from? Arguments and reasoning do not come with labels indicating the argumentation scheme or schemes to which they belong. So how do theorists and textbook writers dream them up? How should they generate them?

14.2 Bottom-Up Generation

One can get an argumentation scheme from any argument, simply by replacing each of one or more "content expressions" (Hitchcock 1985) by a variable with a specified range that includes the replaced expression. Thus the argument 'Socrates is human, so Socrates is mortal' can be viewed as an instance of the scheme 'the individual object x is human, so x is mortal', but also of such schemes as 'Socrates is of kind K, so Socrates is mortal' or 'the individual object x is of kind K, so x has

attribute F'. Working from the ground up in this way, from actual arguments selected in some manner, one has choices of how general to make one's abstraction. At the highest level of abstraction, the argument just mentioned is of the scheme 'p, so q', where the variables p and q range over sentences. At an only slightly lower level of abstraction, the argument has the scheme 'x is F, so x is G', where the variable x might range not only over names of individual objects but also over names of classes of individual objects, properties of individual objects and so on; and the variables F and G might range over predicates of all sorts, including classificatory, descriptive, evaluative and prescriptive predicates. This scheme has the advantage that it catches in its class of instances a very wide range of arguments, for each of which the rule that would license the inference has a single form: From the information that something is F, you are entitled to conclude that it is G. However, rules of this form can be of many types, not only those licensing an inference from a classification to a descriptive attribute ('Socrates is human, so Socrates is mortal'), but also those licensing inferences from an infallible sign to a descriptive attribute ('she is giving milk, so she has given birth'), from a fallible sign to a descriptive attribute ('he is sneezing, so he has an allergy'), from a present causal factor to a predicted future effect ('he is arrogant, so he will lose friends'), from a descriptive attribute to an evaluation ('the novel has an implausible plot, so it is not very good'), from an effect to a prescription ('donating to Médecins sans Frontières would help relieve a lot of suffering, so it's something you should consider seriously'), and so forth. To establish the legitimacy of a rule of inference for any of these types, one needs to establish that members of some specified class of objects that are F must also be G, either universally or for the most part or in the absence of overriding or undermining circumstances. So the goal of evaluation is the same for all of them. But the way in which one establishes the generalization varies from one type of inference to another. To establish that every member of a kind must have a certain attribute, one can appeal either to a definition of what it is to be of that kind or to empirically based well-established non-accidental generalizations about members of the kind. To establish that an attribute F is a sign of another attribute G, one needs empirically based good information that having attribute G typically causes members of some specified kind to which the individual x mentioned in the argument belongs to have attribute F. And so on.

There are choices not only of how general to make one's abstraction but also of how to group particular arguments into classes for the purpose of generalization. Sign arguments of the form 'x is F, so x is G' can be grouped with other sign arguments that are not obviously of that form, such as the argument 'There are dark clouds in the western sky, so it will soon rain'. One can reformulate this argument to fit the form 'x is F, so x is G', by treating the time and place of the utterance as the referent of x: 'There are now dark clouds in the sky to the west of here, so it will rain here soon after now', or, more formally, 'This place now has dark clouds to the west, so soon after now this place will experience rain.' Such recastings require some ingenuity on the part of a theorist trying to generate argumentation schemes from the bottom up.

14.3 A Bottom-Up Approach: The "Argumentative Schemes" of Perelman and Olbrechts-Tyteca

The variability inherent in a bottom-up approach to generating argumentation schemes is well expressed by Chaim Perelman and Lucie Olbrechts-Tyteca, in their ground-breaking work *La nouvelle rhétorique* (Perelman and Olbrechts-Tyteca 1958):

> What we wish to analyze in the following chapters are argumentative schemes of which the particular cases examined serve only as examples … these same argumentative statements could be analyzed differently, in accordance with other planes of cleavage. And this is because there is no reason why a single statement cannot be regarded as capable of expressing several schemes which would act at the same time on the minds of different persons—even on a single hearer. (Perelman and Olbrechts-Tyteca 1969, p. 188; translation modified)

The descriptive approach of Perelman and Olbrechts-Tyteca to identifying schemes illustrates a risk of the bottom-up approach. They pay no attention to how an arguer might establish or an audience evaluate the inferential component of a scheme. There is no mention of "critical questions". They are describing how people actually argue outside demonstrative contexts, and how rhetorical handbooks recommend that they argue. It is of no concern to them whether a form of argument actually establishes the truth of a factual statement, the wisdom of a recommendation, or the merits of an evaluation. All that counts is whether the scheme is effective in securing or intensifying the adherence of the intended audience.

As a result, they abstract forms of argument that some theorists think never have a good inference, such as the argument from waste:

> The argument from waste consists in saying that, since one has already begun a task and made sacrifices which would be lost in case of renunciation of the enterprise, it is necessary to carry on in the same direction. This is the justification furnished by the banker who continues to lend to his insolvent debtor in the hope of ultimately getting him on his feet again. (Perelman and Olbrechts-Tyteca 1969, p. 279; translation modified)

Arguments from waste tend to be persuasive; people do not like to see their past efforts go to "waste". But previously expended resources are, in general, totally irrelevant to whether it is wise to continue a certain course of action. Economists refer to the argument from waste as the fallacy of "sunk costs" (Mankiw et al. 2006, pp. 303–304). According to standard economic analysis, it does not matter how much time or how many resources one has spent on a task. All that counts is whether continuing the task will bring its intended beneficiaries more benefits than costs. The example of the banker which Perelman and Olbrechts-Tyteca use illustrates the point perfectly. As a prudent lender, the banker must base his decision whether to lend more money to his insolvent debtor on the expected future gain or loss to the bank from continuing to lend on the one hand and ceasing to lend on the other. The money already loaned does not enter into the calculation.

Walton has argued (Walton 2002) that the argument from waste is not always fallacious, that it can be construed as an argument from pre-commitment to a course of action, which in some cases is a legitimate form of practical reasoning. His treatment is more nuanced than that of Perelman and Olbrechts-Tyteca, and is supported by careful consideration of the scholarly literature on the rationality of taking sunk costs into account, as well as by a typically nuanced discussion of a varied group of examples where people appeal to sunk costs in their reasoning about what to do. Without such theoretical investigation, bottom-up generation of argumentation schemes can baptize worthless patterns of argument.

14.4 An Indirectly Bottom-Up Approach: Via Supposed Fallacies

One can get argumentation schemes from traditionally recognized informal fallacies, which historically have been identified by abstraction from actual arguments. This approach was the one first taken by Douglas Walton. In their early collaborative work, John Woods and Douglas Walton brought the resources of non-classical formal logics to bear on the analysis of such argumentative moves as circular reasoning (*petitio principii*), reasoning from a sequence to a causal connection (*post hoc ergo propter hoc*), projecting an attribute of a whole to its parts and vice versa (division and composition), and appeals to deference to authority, to force, to the person, to ignorance and to popular approval (ad verecundiam, *ad baculum*, *ad hominem*, *ad ignorantiam*, *ad populum*). Their co-authored papers, collected in (Woods and Walton 1989), commonly note that the argumentative move stigmatized as fallacious is in fact quite respectable under certain conditions. The move is only a fallacy when its associated critical questions have unsatisfactory answers. This general pattern of analysis continued in Walton's subsequent solo work on fallacies, which often took the form of an entire book on an individual fallacy or related group of fallacies. In his 1996 book an argumentation schemes for presumptive reasoning, Walton makes the link to his work on fallacies clear: "Many of the fallacies are misuses of presumptive inference." (Walton 1996, p. ix)

14.5 Top-Down Generation

Garssen (2001, p. 81) has nicely distinguished three different purposes for which one might use a system of argumentation schemes: for inventing arguments, for evaluating arguments, and for describing how a certain group of people reason and argue. Bottom-up approaches to generating argumentation schemes presuppose the existence of arguments from which an argumentation scheme can be generated, and thus go naturally with the use of argumentation schemes for purposes of evaluation and analysis. Top-down approaches do not require pre-existing arguments, and go

naturally with the use of argumentation schemes to guide a search for evidence relevant to a proposition to be proved (invention) or to a question to be investigated (inquiry). Ennis (2009), for example, proposes that an explanatory hypothesis is supported roughly to the extent to which, given reasonable assumptions, (1) it can explain (account for) evidence—or help to do so; (2) there is no evidence that is inconsistent with the hypothesis; (3) evidence is inconsistent with alternative explanations of the data; (4) the hypothesis is plausible—it fits with what else we know; (5) realistic and earnest attempts have been made to find counter-evidence and alternative hypotheses; (6) the hypothesis implies new evidence (especially helpful if the new evidence is surprising); and (7) the evidence is well established. (Ennis 2009, p. 79). These criteria apply generally to any hypothesis devised to explain some data. As a rough and incomplete strategy based on these criteria, we might propose the following: To figure out how to explain some data, generate possible explanations, consider what would be expected to occur given each of the possible explanations, check these expectations against the evidence you already have from observation, and carry out any needed systematic observations or experiments until you rule out all but one of the possible explanations.

How can the experience of invention and inquiry be used to generate argumentation schemes? Inquiry begins with a question, which may need to be refined as investigation proceeds. Invention is directed at support of a thesis, which can be regarded as an answer to a question. Argumentation schemes for inquiry and invention can thus be generated from a taxonomy of questions, which ideally would be based on a single principle of division that creates a set of jointly exhaustive and mutually exclusive classes of questions, where each class has in common a single quasi-algorithmic pathway to determining the correct answer to the question. This ideal is however practically unachievable. For example, the forum in which the results of inquiry and invention are to be articulated can influence the nature of an argumentation scheme. In scientific inquiry, the goal is to eliminate decisively all but one of the plausible explanations of a phenomenon under investigation. This goal may take decades to achieve, as in biologists' investigation of the way in which energy is released in the cells of living organisms, an investigation ably described in Chap. 4 of Weber (2005). In a legal proceeding, on the other hand, the goal varies according to whether the proceeding operates on an adversarial or an inquisitorial model and according to whether the inquirer or inventor is an advocate for one side or a judge. In a criminal case in a common law jurisdiction, the goal of the prosecution is to show beyond a reasonable doubt that the accused is guilty as charged, the goal of the defence is to show that there is at least a reasonable doubt about the same proposition, and the goal of the judge is to determine whether the evidence, testimony and arguments presented by the two sides collectively establish beyond a reasonable doubt that the accused is guilty as charged. In a civil case, on the other hand, the judge is to determine the issue (e.g. whether there has been a breach of contract) on a balance of probabilities.

Furthermore, in specialized fora the search for evidence that would support a favoured explanatory hypothesis may be only part of the task of invention. The *stasis* theory of the ancient rhetorician Hermagoras of Temnos distinguishes

four types of issues (*staseis*) that the defence can raise in response to an accusation: conjecture (whether the accused performed the deed), definition (whether the deed meets the definition of the alleged crime), quality (whether the deed was justified), objection (whether the procedure for bringing an accusation has been followed); see for example the description of this system in Cicero's *De Inventione* I.10-16 (Cicero 1949). This system could be used to generate an argumentation scheme for establishing the guilt of an accused, but the scheme would quickly ramify into a large number of sub-schemes, depending on the elements of the crime alleged to have been committed and the procedural requirements for bringing a charge.

Further, some argumentation schemes straddle different types of questions. Reasoning by analogy, for example, is appropriate in any inquiry where there is an inadequate theoretical basis on which to work out an answer to the question. Such situations arise with a variety of types of questions, including questions about possible explanations of a puzzling phenomenon, questions about what is morally or legally required in a novel or perplexing type of situation, and questions about the current market value of a piece of real estate. The ideal of a systematic division of argumentation schemes for invention and inquiry on the basis of a principled division of questions into mutually exclusive and jointly exhaustive classes thus seems at most partially attainable.

14.6 A Top-Down Approach: Grennan's Combinatorial Generation

Perhaps the most systematic purely top-down approach to generating argumentation schemes is that of Wayne Grennan in his *Informal Logic: Issues and Approaches* (Grennan 1997). Without any reference to a corpus of arguments from which schemes are abstracted, Grennan tries to generate a complete list of all forms of single-premiss arguments that have the potential to give inductive support to their conclusion, in the sense that under certain circumstances the conditional probability that the conclusion of an argument of the given form is true given that the premisses are true is greater than 0.5 but less than 1. He calls such forms "presumptively valid".

Grennan starts by distinguishing eight sorts of claims that may occur as a premiss or as a conclusion: obligation claims, supererogatory recommendations, prudential recommendations, evaluative claims (which may be either gradings or rankings or comparisons), physical-world claims (which may be either brute facts or institutional facts), mental-world claims, constitutive-rule claims (based on necessary truths and falsehoods, e.g. definitions), and regulative-rule claims (expressing obligations or permissions in a system) (p. 162). Each of the 64 resulting possible combinations could potentially fit into any of nine types of argument patterns: cause to effect, effect to cause, sign, sample to population, parallel case, analogy, population to sample, authority, and ends-means. Thus abstractly there are 576 (9 times 64) combinations of premiss-type, conclusion-type and argument-pattern-type to be examined to see if the argumentation scheme so constituted could be inductively strong. However,

many combinations are impossible; by ruling out such impossible combinations as an argument from authority whose premiss is a supererogatory recommendation, Grennan narrows the field to 227 combinations, some of which however are never presumptively valid. For the rest, Grennan provides a "sketch" that includes the premiss form, the conclusion form, an example, the warrant backing and rebuttal factors. His treatment of the first of four valid patterns with obligation premisses will indicate the nature of his treatment:

> *Arguments with Obligation Premisses … Sample-to-Population Version*
>
> Premiss Form: N% of x's must do A.
>
> Conclusion Form: N% of X's must do A.
>
> Example: "Seventy percent of the 100 15-year-olds polled in Halifax must be home by 10:00 P.M. on weekday nights. Therefore, 70% of Canadian 15-year-olds must be home by 10:00 P.M. on weekday nights."
>
> Warrant Backing: x is representative of X.
>
> Rebuttal Factors: (1) The sample is too small; (2) there is systematic bias in the sample selection. In the example it is plausible to think that a systematic bias results from conducting the poll in a small geographic area. (p. 166)

It may be doubted whether there is much benefit to distinguishing as separate argument patterns eight different ways of arguing from sample to population, according to which type of claim occurs as premiss and conclusion. In fact, Grennan takes sample-to-population arguments with a supererogatory (p. 170) or prudential (p. 174) premiss and conclusion to be useless for proof, because anyone doubting the conclusion would be just as likely to doubt the premiss, and he notes that there cannot sensibly be sample-to-population arguments with a constitutive-rule (p. 195) or regulative-rule (p. 197) premiss and conclusion. The valid patterns of sample-to-population reasoning have a premiss and conclusion that are both either obligation (p. 166) or grading (p. 177) or ranking (p. 178) or comparison (p. 179) or physical-world (p. 186) or mental world (p. 190) claims. For each of these six valid patterns, Grennan proposes as the warrant backing that the sample is representative of the population and as rebuttal factors that there is a sample-selection bias and that the sample is too small. Apart from the apparently accidental omission of the rebuttal factor of small sample when the premiss is a ranking claim, and the duplication of the warrant and rebuttal factors for the two things being compared when the premiss is a comparison claim, there is no difference in the evaluative questions proposed for the six argumentation patterns. So what is the point of distinguishing them? It would be more useful, both theoretically and practically, to treat sample-to-population reasoning as a single argumentation scheme, to note that such reasoning can make sense and be probative only with six types of claims as premiss and conclusion, to elaborate in more depth on the warrant backing and rebuttal factors, and to note the duplication of the evaluation questions when an argument projects a comparison from a sample to a population. In fact, Grennan's proposals for the warrant backing and rebuttal factors leave much to be desired. The proposition that the sample is representative of the population is

not the backing for the warrant, but is the warrant itself: If N% of a sample x has property F, then approximately N% of the population X has property F. The backing for such a warrant is complex, and can vary from one type of sample-to-population projection to another. If all members of the sample have property F, then the projection of the property to the population can be justified by theoretical reasons for taking the population to be uniform with respect to the variable of which F is a value; for example, all samples of a chemical compound can be expected to have the same solubility in pure water, so that testing one sample for solubility is enough, or perhaps two to check for contamination of the compound or the water or deficiencies in lab technique. Or one may establish representativeness by pointing out that the sample was selected by a genuinely random method from the population to which the property is being projected, where a genuinely random method is one that gives every member of the population an equal chance of being selected for the sample. Or, in cases where the method of selection was not random, one can weight the contribution of members of the sample to determining the percentage with property F so as to make the distribution in the sample of various properties thought to be associated with having property F correspond to the known distribution in the population of these properties. In fact, it is entirely artificial to put biased selection and small sample as rebuttal factors and representativeness as backing for the warrant. The size and manner of selection of the sample are required to establish representativeness; they are not just rebuttal factors.

Rather than 227 candidates for presumptively valid argument patterns, then, there are nine such patterns. In discussing each of them, one can recognize different sorts of premiss-conclusion combinations that fit the pattern. But, unless the evaluation questions differ substantially from one group of such combinations to another, there is no point in separate treatment of the combinations.

14.7 A Mixed Approach: Hastings' "Modes of Reasoning"

Several theorists, including Hastings (1962), Schellens (1985) and Kienpointner (1992), take a mixed approach that combines a theoretically based taxonomy of claims or rules of inference with reference to a corpus of arguments. Hastings, for example, intended his "modes of reasoning" as guides to debaters, whose task is to frame and deliver arguments for or against a given proposition. Thus he identified six of his nine modes of reasoning by the type of conclusion to be argued for, in each case with a corresponding type of premiss suited to establish the conclusion, and in this respect his generation of argumentation schemes was top down. However, it was in another respect bottom up, in that he abstracted his nine modes from a corpus of 250 arguments selected from a variety of rhetorical sources. The first six modes were as follows (Hastings 1962, pp. 25–93), with the frequency of their occurrence in Hastings' sample (p. 175) indicated in parentheses:

1. from example to a descriptive generalization (26%)
2. from criteria to a verbal classification (20%)
3. from definition to characteristics (7%)
4. from sign to an unobserved event (5%)
5. from cause to effect: prediction (10%)
6. from circumstantial evidence to hypothesis (6%)

The debater can identify the proposition being debated as one of the six types of conclusion distinguished in these modes, and can use the schemes to determine what type of evidence would support that type of conclusion and what type of evidence could be used to undermine or override evidence for that type of conclusion.

Hastings characterized the remaining three processes only in terms of their starting point, on the ground that they are usable in proving conclusions of various types (Hastings 1962, pp. 93–139):

7. from comparison (3%)
8. from analogy (2%)
9. from authority (testimony) (18%)

The remaining 3% of the arguments in Hastings' sample were unclassified.

14.8 Choices in the Generation of Argumentation Schemes

As previously mentioned, bottom-up generation can produce schemes at various levels of abstraction. Greater generality makes a scheme more widely applicable and leads to a more manageable typology, but at the price of a certain crudity in the recipes the schemes provide. For example, the scheme for reasoning by analogy, if it is to be used for invention, directs someone who wishes to argue that a case of interest has a queried property (e.g. that a piece of information passed on to a company's competitor was a trade secret) to look for similar cases that are known to have the queried property (as well as for partly similar cases known to lack the queried property that can be distinguished from the case of interest). One may even include in the scheme the suggestion to look for similarities that are relevant, in the sense that they are values of variables that stand in more or less tight determination relations to the variable of which the queried property is a value (Ashley 1988). But such advice is too general, for example, for a real estate appraiser who is searching for recent sales of comparable properties in order to determine by analogy the market value of a property being appraised. The real estate appraiser needs to know what variables are relevant, such as the location, lot size, floor area of the building on the lot, and so forth. A general scheme for reasoning by analogy may be accurate as far as it goes, but its application as a tool for invention requires supplementation by knowledge of the particular field in which one is reasoning analogically. The same point holds if the scheme is to be used for analysis or evaluation of an already existing argument by analogy.

As a tool for analysis, a system of argumentation schemes should be based upon an empirical study of the arguments that people actually produce and the reasoning that they actually engage in. An important constraint on the development of argumentation schemes as tools for analysis is that they should not distort the form of the arguments from which they are abstracted. But the empirical adequacy of a system of schemes is no guarantee that scholars will or should accept it as a fruitful analytical tool. Perelman and Olbrechts-Tyteca, for example, developed a system of schemes on the basis of a 10-year empirical study of texts from the European rhetorical, literary and philosophical tradition. But their system has not won general acceptance, with the exception of its identification of dissociation as a distinctive form of argument.

As tools for evaluation, argumentation schemes should reflect a well-grounded theory of good inference. Whatever one's preferred taxonomy of general ways of legitimately inferring conclusions from reasons, however, there is a difficulty with using such a taxonomy as a basis for generating argumentation schemes: some argumentation schemes straddle different types of legitimate inference. Arguments by analogy, for example, share the common form of projecting a queried property from one or more analogues to a case of interest on the basis of assumed similarities. Their inference is good if the assumed similarities are relevant to the possession of the queried property and are not "outweighed" by unmentioned relevant dissimilarities. But the determination relations that make a similarity or dissimilarity relevant vary in how tight or loose they are. Some are exceptionless, as in the determination of the province or territory in which an address is located by the first letter of a Canadian postal code, which licenses non-defeasible analogical inferences.[1] Others reflect loose causal relationships where many factors affect a result of interest, like the market value of a piece of real estate, and the corresponding analogical inference is probabilistic and defeasible. Still others express criteria for attributing supervenient properties like classifications, evaluations or prescriptions, where inductive approaches do not naturally apply and corresponding analogical inferences are best understood as cases of Walton's plausible reasoning.

14.9 Summary and Conclusion

One can generate argumentation schemes purely from the bottom up, first collecting a heterogeneous corpus of arguments that might be expected to exemplify the ways in which people actually argue and then grouping the arguments by perceived similarities of form unguided by any theoretical insight into criteria for a good form of inference. Such theoretically naïve groupings are somewhat arbitrary and are likely to prove unsatisfactory as a guide to understanding and evaluating arguments. At the opposite extreme, one can generate argumentation schemes from the top

[1] *Correction in the present republication*: The original article had the determination relation reversed.

down, starting from taxonomies of statements and of rules of inference, in each case generated by epistemological considerations. Such empirically unrooted templates risk a combinatorial explosion of unrealized abstract logical possibilities. A more fruitful approach is to combine a framework of types of statements and of reasonable inference with an empirical base of actual arguments, with the goal of constructing a usable instrument for inquiry, invention, analysis or evaluation. The system of schemes that results need not be complete, but it should be comprehensive, and the schemes should be distinguished in a natural way according to the set of critical questions belonging to each scheme.

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Chapter 15
Instrumental Rationality

Abstract Comprehensive reasoning from end to means requires an initiating intention to bring about some goal, along with five premisses: a specified means would immediately contribute to realization of the goal, the goal is achievable, the means is permissible, no alternative means is preferable, and the side effects do not outweigh the benefits of achieving the goal. Its conclusion is a decision to bring about the means. The scheme can be reiterated until an implementable means is reached. In a particular context, resource limitations may warrant truncation of the reasoning.

15.1 Introduction

Instrumental rationality is rationality in the selection of means, or instruments, for achieving a definite goal. The goal is some state of affairs to be brought about at some future time through the agency of some person or group of persons, who need not be identical with the person or persons reasoning from end to means. A presupposition of such reasoning is that the intended end does not already obtain, and will not come about without some effort on the part of one or more agents to realize it. The means selected may be a single action by a single person, such as leaving one's home at a certain time in order to keep an appointment. But it may also be a plan, more or less completely specified at first, such as the plan of the

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declarer in a game of contract bridge to draw trumps first in an attempt to make the contract. Or it may be a policy, such as a policy of working out on a regular basis in order to maintain one's fitness. The goal may be a personal goal of the agent, as in the examples just mentioned. It may also be a broad social goal, like the initial target proposed by Hansen et al. (2008) of reducing the concentration of carbon dioxide in the Earth's atmosphere to at most 350 parts per million. The goal may be difficult to realize, with severe restrictions on available means and unreliable or incomplete information available to the reasoner or reasoners about the relevant initial conditions and causal relationships.

As pointed out in Girle et al. (2003), reasoning from a goal in mind to a chosen means is just one form of reasoning about what is to be done, a genus often called "practical reasoning". Means-end reasoning should be distinguished, for example, from deciding to act in a certain way on the basis that the action has in itself a certain character, apart from its consequences, as when someone notices that a store clerk has neglected to charge them for an item and decides to bring the omission to the clerk's attention, on the ground that doing so is the honourable thing to do in the situation. Here mentioning the omission is not a means to behaving honourably, but is an instance of such behaviour in concrete circumstances. The distinction between such reasoning and means-end reasoning may be difficult to draw, since as Anscombe has pointed out (1963) one and the same action can have a variety of descriptions, some of which may incorporate the (expected or actual) achievement of a goal; means-end reasoning is however distinctive in involving reference to a causal chain from the selected means to the intended goal. Another form of practical reasoning is reasoning from general prescriptions or proscriptions to a conclusion about what must or cannot be done in some particular situation, as when one decides to keep silent about confidential information that one's audience has no right to know. Still other forms of practical reasoning concern the determination of what goal is to be pursued. In some cases, the goal is an intermediate goal, itself reached by a process of means-end reasoning, as in the proposal to reduce atmospheric carbon dioxide to at most 350 parts per million:

> If humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted, paleoclimate evidence and ongoing climate change suggest that CO_2 will need to be reduced from its current 385 ppm to at most 350 ppm, but likely less than that (Hansen et al. 2008, p. 217).

In other cases, the goal may be a final goal, not a means to achieving some further end; Richardson (1994) has argued persuasively that it is possible to reason in various ways about such final ends. Another form of practical reasoning is deciding what to do on the basis of a number of relevant but separately inconclusive considerations, as when one chooses whether to spend a free evening watching a movie or reading a novel or going out for a drink with some friends. So-called "pragmatic argumentation" for or against some policy on the basis of its consequences (Ihnen Jory 2011) involves yet another form of practical reasoning. Still another form of practical reasoning is that envisaged by standard causal decision theory (Weirich

2010), in which one calculates the expected utility of one's options with a view to choosing the one with the highest expected utility.

Any decision-making about what is to be done may need to take into account a variety of types of factors: goals, prescriptions, prohibitions, valuable and "disvaluable" features, likes and dislikes, and so forth. Hence there may be considerable overlap, and even identity, between the sets of "critical questions" associated with reasoning schemes or argumentation schemes for two different types of practical reasoning. Nevertheless, it is useful to consider means-end reasoning separately from other forms of practical reasoning, because of its specific characteristic of starting from an intention to pursue a definite goal.

It is often taken to be obvious what instrumental rationality is. Habermas (1984, p. 9) remarks simply that from the perspective of "cognitive-instrumental rationality" goal-directed actions are rational to the extent that their claims to effectiveness can be defended against criticism. Larry Laudan, advocating an instrumental conception of scientific rationality, writes:

> The theory of instrumental rationality simply insists that, once one has settled on one's … desired ends, then the issue of the appropriate methods of appraisal to use depends on what strategies conduce to the realization of the selected end (Laudan 1990, p. 318).

Effectiveness of the means in securing the selected end is however often a difficult matter to determine in advance. Further, an agent may be simultaneously pursuing several goals at once, for example in conversational interaction (Tracy and Coupland 1990). Further, effectiveness is not always the only factor that needs to be kept in mind. As Perelman and Olbrechts-Tyteca (1969, p. 278) point out, everyday reasoning can rarely eliminate all considerations of value other than those that relate to the end in view. Hence there is more than Habermas and Laudan acknowledge to be said about instrumental rationality.

In what follows, I review the factors that may need to be taken into account when someone reasons from a concrete end in view to a means adopted with a view to achieving it, and as a result of that review propose a comprehensive scheme for means-end reasoning, whose implementation in particular domains or circumstances may be truncated, for example because of resource constraints. I focus on solo reasoning by a single agent, on the ground that such reasoning is simpler than that involved in a deliberation dialogue where two or more agents seek to arrive at an agreement on what is to be done in the pursuit of one or more antecedently agreed goals. Solo means-end reasoning is also simpler than justification of one's choice of means to a rational critic. One can of course represent solo means-end reasoning as a kind of dialogue with oneself, in which one alternately takes the role of a proponent and of a rational critic. But this representation only occasionally corresponds to the way in which solo means-end reasoning actually proceeds, and there seems to be no theoretical gain from shoe-horning solo means-end reasoning into an implicitly dialogical format. In fact, there is a theoretical risk in this approach of taking recognition that some means will achieve an agent's intended goal as establishing a presumption that the agent should perform it (cf. Walton 1996, p. 12)—an assumption that Kock (2007) has cogently refuted.

15.2 Selection of the Goal

Means-end reasoning begins with the adoption as one's aim of one or more concrete ends in view. The standard belief-desire model of how reasoning issues in action, a model that comes from Aristotle (Aristotle 1984, *Nicomachean Ethics* III.3) and Hume (*Treatise* II.3.3), treats the mental state of having a goal in mind as a desire. So does the more sophisticated belief-desire-intention (BDI) model due to Bratman (1987). Certainly one wants to achieve whatever one has decided to pursue as a goal. But there is more to having something as one's goal than wanting it to come about, as Searle (2001) has noted. One can want something that one recognizes to be impossible, such as personal immortality on Earth, so that one makes no effort to pursue it as a goal, while nevertheless still wishing that it might come about. One can quite rationally have two desires that one recognizes cannot both be satisfied, such as the proverbial desire to have one's cake and eat it too, but one cannot rationally pursue as a goal the satisfaction of both desires once one has recognized that both cannot be satisfied. The starting-point of solo means-end reasoning might better be described as an intention to bring about an end, rather than a desire. It is not a judgment that one has the end as one's goal, and its verbal expression (to oneself or someone else) is not a statement that one has the end as one's goal. The speech act corresponding to the intention that initiates means-end reasoning would be some sort of directive, expressible linguistically by a first-person-singular imperative of the sort grammaticalized in some languages, for example classical Greek.

This proposed alternative to belief-desire and belief-desire-intention models of means-end reasoning was articulated independently of the belief-goal model proposed by Castelfranchi and Paglieri (2007), to which it is similar in some respects. Castelfranchi and Paglieri conceive of a goal as

> an *anticipatory internal representation* of a state of the world that has the *potential for* and the function of (eventually) *constraining/governing the behaviour of an agent towards its realization* (Castelfranchi and Paglieri 2007, p. 239, italics in original).

This conception is broader than the conception of a goal assumed in the present paper, in that for them a goal is not necessarily actively adopted as a constraint on action; it may merely have the potential for such constraint. In the present paper, a goal is conceived as something adopted as a concrete end in view and as actually constraining at least the agent's thinking about what is to be done.

Intentions to pursue something as a goal are subject to rational criticism. The goal may be unattainable, so that attempts to pursue it are a waste of time and resources. Once achieved, it may turn out to be quite different than one imagined it to be, or just much less to one's liking than one had supposed—an eventuality warned against in the saying, "Be careful what you wish for, 'cause you just might get it", echoed in the title of cautionary lyrics by the American rapper Eminem (2008). If the goal is an intermediate goal, it can be criticized on the ground that it is ineffective for its intended purpose. It can also be criticized because it does not in

fact realize the values that motivate its pursuit. Atkinson and Bench-Capon (2007) have proposed to distinguish the goal pursued from the values realized by its implementation, as a way of providing for multi-agent agreement on a course of action despite differences in value preferences. Values in their approach are prized features of states of affairs, as opposed to concrete states of affairs like the examples in (Castelfranchi and Paglieri 2007): marrying a certain person, cooking liver Venetian style, becoming a Catholic priest, completing a dissertation, submitting an article to a journal. A distinction between goals and values is useful in solo means-end reasoning, as a way of opening up a mental space for reformulation of the goal if it seems difficult to achieve, by adopting a different goal that realizes the same value. In fact, a goal can be pursued in order to realize simultaneously a number of values. For instance, in the repressive regime in the Soviet Union from late 1982 to early 1984, a young university student was determined to lose his virginity before marriage as a form of resistance to the regime's ideological pressures (in this case, pressure to have sex only within marriage), as well as of gaining self-respect and respect in the eyes of his peers (and sexual satisfaction); achievement of the goal would thus realize simultaneously, in his view, political, psychological and social values. Objections that achieving the goal would not in fact realize one or other of these values would count as a criticism of the intention to pursue the goal, a criticism that could be countered by taking realization of the remaining values as sufficient grounds.

The fact that adopted goals are subject to rational criticism opens up the question of the ultimate touchstone of practical reasoning, including means-end reasoning. In reasoning and argument about what is the case, the ultimate touchstone, if one adopts an epistemological rather than a purely dialectical or rhetorical perspective, is what is the case. Ideally, one's reasons should be known to be true, and each conclusion in one's chain of reasoning should be known to follow from the reasons offered in its immediate support, where following means that it is impossible for the reasons to be true while the conclusion is untrue. Less stringent epistemic criteria of premiss adequacy and inference adequacy get their rationale from their aptness at tracking what is the case; for example, justified beliefs or beliefs acquired by a generally reliable process are likely to be true, and instances of inductively strong or *ceteris paribus* forms of argument tend to have a true conclusion if they have true premisses.

Is there an analogous touchstone for reasoning about what is to be done? From a purely dialectical perspective, the touchstone is acceptance by one's interlocutor of whatever starting-points and rules of inference are used to generate a conclusion about what is to be done. From a purely rhetorical perspective, the touchstone is adherence by one's intended audience to the starting-points and rules of inference. An epistemological perspective looks for some factor other than agreement or adherence. A plausible candidate is what Pollock (1995) calls a "situation-liking", a feeling produced by an agent's situation as the agent believes it to be, of which humans are introspectively aware, and from which Pollock proposes to construct a cardinal measure of how much an agent likes a token situation. This cardinal measure, which has some similarities to measures of a person's utilities on the basis

of their qualified preferences, can be fed into standard decision-theoretic calculations of the sort described by Weirich (2010). Pollock's proposal for the architecture of a rational agent, complex as it is, suffers from being solipsistic, asocial and amoral (Hitchcock 2002). It might profitably be supplemented by the account of the common morality of humanity developed by Gert (2005). Gert construes morality as an informal institution for reducing the harm that human beings suffer. He defines an evil or harm as something that all rational persons avoid unless they have an adequate reason not to, and a good or benefit as something that no rational person will give up or avoid without an adequate reason (p. 91). On this basis, and taking into account the types of treatment that count as punishment and the types of conditions that count as maladies for medical purposes, the basic personal evils or harms are death, pain, disability, loss of freedom and loss of pleasure; and the basic personal goods are consciousness, ability, freedom and pleasure (p. 108). Gert's list of basic personal harms and basic personal benefits can be regarded as common inputs for rational human beings to the situation-likings (and situation-dislikings) that Pollock takes as fundamental to practical reasoning.

15.3 Consideration of Possible Means

However the adoption as a goal of some concrete end in view is to be critiqued or justified, and whatever the ultimate touchstone for any such critique or justification, the goal is just the starting-point of means-end reasoning. The next stage is the consideration of possible means of achieving the goal (or goals, if the reasoner aims to pursue more than one goal at once).

Two constraints on the search for effective means ought to be noted at the outset.

First, the search takes time and resources, which must be weighed against the benefits of finding some theoretically optimal path to one's goal, as compared to other desirable results from using the time and resources in a different way. Aristotle tells us that, "if it [the end—DH] seems to be produced by several means, they [those who deliberate] consider by which it is most easily and best produced" (Aristotle 1984, *Nicomachean Ethics* III.3.1112b16-17). His description has the merit of recognizing more than one criterion for choosing among possible sufficient means, not just ease or efficiency but what we might translate as "fineness". But the cost of discovering the most efficient and finest path to one's goal may be greater than the payoff in extra efficiency or beauty, as is commonly recognized in work on agent reasoning in computer science. As Perelman and Olbrechts-Tyteca point out:

> If the value of the means is to be enhanced by the end, the means must obviously be effective; but this does not mean that it has to be the best. The determination of the best means is a technical problem, which requires various data to be brought into play and all kinds of argumentation to be used (Perelman and Olbrechts-Tyteca 1969, p. 277).

Second, there are often ethical, legal or institutional constraints on acceptable means. For example, researchers designing a study to determine the effectiveness of

an educational or therapeutic intervention must make sure that the design respects ethical guidelines for research using human subjects. The declarer in a game of contract bridge who works out a strategy that maximizes the chance of making the contract does so within the framework of the rules of the game, such as the rule that each player must follow suit if possible. And so on. Constraints of these sorts usually operate in the background of a person's thinking, in the sense that the person considers only means of achieving the goal that are allowed by the constraints. Nevertheless, their operation should be acknowledged in a comprehensive account of instrumental rationality.

Perhaps the simplest case of selecting a means for achieving a goal is the case where exactly one means is required. This case seems to be the only type of means-end reasoning where something akin to the strictness of formal deductive validity comes into play. Kant expresses the underlying principle as follows:

> Whoever wills the end, also wills (insofar as reason has decisive influence on his actions) the means that are indispensably necessary to it that are in his control (Kant 2002, p. 34 [Ak4:417]).

Kant maintains that this principle is an analytic necessary truth, that there is a kind of volitional inconsistency in the combination of setting out to achieve some goal, recognizing that some action in one's power is required for the achievement of that goal, but nevertheless not proceeding to perform the required action. Searle, despite his claim that "there is no plausible logic of practical reason" (2001, p. 246), concedes that in one special sense Kant's claim is correct: "If I intend an end *E*, and I know that in order to achieve *E* I must intentionally do *M*, then I am committed to intending to do *M*." (p. 266) Searle's formulation qualifies Kant's claim in three ways, each needed to block counterexamples. The agent does not merely desire the end but intends it. The means is not just necessary for achieving the end but is known by the agent to be necessary. And for achievement of the end it is necessary that the agent intends to bring *M* about, not just that *M* occur.

The scope of Kant's principle is however rather narrow, since we rarely know that we must intend to do something in order to achieve some intended goal. And the principle is a two-edged sword. One can use it either to justify implementing the necessary means or to justify abandoning or modifying one's goal. In general, as Perelman and Olbrechts-Tyteca note, the end justifies the means only sometimes: "the use of the means may be blameworthy in itself or have disastrous consequences outweighing the end one wishes to secure." (p. 276) In the case of a necessary means, it may also turn out that the goal will not be achieved even if one implements the means, because of other factors beyond one's control; in that case, the reasonable thing to do is to abandon or modify the goal rather than to implement the means (unless there is some independent reason for implementing it).

If one determines that a means to one's goal is not only necessary but sufficient, that the means is achievable and permissible, that it is not in itself undesirable, that it brings with it no overriding unwelcome side-effects, and that it does not impede the pursuit of one's other goals, then one's course is clear: One should adopt the means as one's intermediate goal, and as a plan of action if one can implement it directly.

A slightly more complicated situation arises when achievement of the goal requires implementation of one of a number of means, which might for example be specifications of some generic means. Here consideration of the ease of achieving each means, its permissibility or impermissibility, its intrinsically desirable or undesirable features, the desirability or undesirability of its side-effects, and its effect on the possibility of achieving one's other goals may come into play in selecting among these disjunctively necessary means. It seems difficult to propose an algorithm or quasi-algorithm for taking such considerations into account. Walton's selection premiss in his necessary condition schema for practical reasoning is perhaps the best one can do by way of a general statement:

> I have selected one member B_i [of the set of means, at least one of which is necessary for achieving my goal—DH] as an acceptable, or the most acceptable, necessary condition for A [my goal—DH] (Walton et al. 2008, p. 323; cf. Walton 1990).

A different situation arises when there are several ways of achieving the goal, each of them sufficient. It is this situation that Aristotle envisages when he describes a deliberator as selecting the easiest and best means. As indicated by previous remarks in this chapter, however, it is not necessarily rational to select the easiest and best of a number of means that are each sufficient to achieve one's goal. The easiest and finest way to bring about an intended end might have foreseeable consequences whose disadvantages outweigh the benefits of achieving the goal. Or all the available means might violate a moral, legal or institutional constraint. The time and resources required to achieve the goal might not be worth it. Again, perhaps the best one can do in the way of a general statement about how to select among a number of sufficient means for achieving one's goal is Walton's selection premiss in his sufficient condition schema for practical reasoning:

> I have selected one member B_i [of the set of means, each of which is by itself sufficient for achieving my goal—DH] as an acceptable, or the most acceptable, sufficient condition for A [my goal—DH] (Walton et al. 2008, p. 323; cf. Walton 1990).

In many cases, the information available does not permit identification of either a necessary or a sufficient means for achieving one's goal. One may know only the probable consequences of the options open to one, especially if those consequences depend on the actions and reactions of other agents. Perhaps less importantly, one's information about causal connections or initial conditions may be incomplete, inaccurate or even inconsistent. One may have to settle for an action that only makes it probable that one will achieve one's goal. Indeed, in some situations the most rational decision is to do something that has only a slim chance of achieving it, if it is the only possible way.

Whether a means under consideration is a necessary, sufficient, probable or even merely possible way of achieving one's goal, a number of considerations can make one hesitate before proceeding to bring about the means in question: conflicting goals, alternative means, practical difficulties, side-effects. These considerations are well captured in the premisses and critical questions of Walton's necessary

condition and sufficient condition schemata for practical reasoning (Walton et al. 2008, pp. 323–324)

Provision needs to be made, however, for the sort of backwards chaining that Aristotle describes, from an ultimate goal through intermediate means to a means that is in one's power (or in the power of an agent on whose behalf one is reasoning):

> … if it [the end—DH] is achieved by one < means—DH > only they consider how it will be achieved by this and by what means this will be achieved, till they come to the first cause, which in the order of discovery is last… (*Nicomachean Ethics* III.3.1112b17-19)

The conclusion of means-end reasoning is not a judgment that something is the case, or even a judgment that something ought to be brought about. It is a decision to bring something about, as Aristotle already recognized, or a recommendation that someone else bring it about. Its verbal expression would be some sort of directive rather than an assertive.

15.4 Conclusion

If we put together the considerations raised in the preceding discussion, we get the following rather complicated scheme for solo reasoning from a goal in mind to a selected means:

Initiating intention of an agent A: To bring about some goal *G* (where *G* is described as some future state of affairs, possibly but not necessarily including a reference to *A*).
Immediate means premiss: Means *M1* would immediately contribute to bringing about goal *G* (where *M1* is describable as a present or future state of affairs and may or may not be an action of *A*).
Achievability premiss: *M1* is achievable as the result of a causal sequence initiated by some policy *P* of some agent (where the agent may or may not be *A*) in the present circumstances *C* (where achievability may be a matter of possibility or probability rather than something guaranteed).
Permissibility premiss: *M1* violates no applicable moral, legal or institutional rule without adequate justification for the violation.
Alternative means premiss: No other permissible means that would immediately contribute to bringing about goal *G* is preferable to *M1* in the light of the sum total of considerations relevant to choosing a means of bringing about an end, such as the probability in the circumstances that the means will bring about the end, the economy of time and resources involved in producing the means, the value on balance of the side effects of the means, and the intrinsic merits and demerits of the means.
Side effects premiss: The side effects of *M1*, including its effect on the achievement of other goals of *A*, do not outweigh the expected benefit of achieving *G* (where the

expected benefit is a function of the values promoted by *G*, the degree to which achieving *G* will promote each of those values, and the probability that *G* will occur as the result of *M1*).
Concluding decision: To bring about *M1*

If *M1* is not a policy that an agent can immediately implement in circumstances *C*, then the scheme would need to be applied again, with *M1* as the new goal and *M2* as the hoped-for new means. Application of the scheme should continue until a means is selected that is within the power of the relevant agent.

The alternative means premiss is schematic, and would need to be fleshed out for a given practical context in a given domain. In a situation where neither of two mutually exclusive means that would contribute to achievement of the goal is preferable to the other, there is no basis for choosing one means over the other. It would be equally rational to choose either.

The scheme needs supplementation with a scheme for selection of goals, including refinement or replacement of a goal that turns out to be unachievable in an acceptable way. Castelfranchi and Paglieri (2007) make some helpful suggestions in this direction, with a general characterization of belief-based goal selection, a characterization that could serve as inspiration for critical questions in various forms of practical reasoning. The approach of Atkinson and Bench-Capon (2007) of distinguishing goals from the values they promote could also be useful in this context.

There is also a need to supplement the generic scheme for means-end reasoning with a general framework for updating one's plans in the light of new information, as for example when the play of cards in a game of contract bridge reveals more information to the declarer about the opponents' hands.

It may not make sense to deploy the full scheme in a given situation where one has a goal in mind and needs to work out a means of achieving it. The cost of deploying the full scheme may not be worth any extra benefits so obtained. But, as pointed out by Fabio Paglieri in his review of an earlier version of this paper, such cost-benefit considerations do not diminish the analytical value of the scheme, since even simplified heuristics for decision making can be seen as abridged or modified versions of it. For instance, focusing one's attention only on a few options simply means applying the alternative means premiss to a limited sub-set of potential means or considerations relevant to the choice of such means. Adopting a satisficing perspective, as proposed by Simon (1956), requires a modified version of the alternative means premiss: that no other satisficing means has been discovered that is preferable to the satisficing means *M1*. More generally, economies in decision making would likely involve neglecting or simplifying the alternative means premiss and/or the side effects premiss, since these are the most costly premisses in this scheme. In particular contexts, it may make sense to treat the issues of alternative means and side effects as the subject of critical questions, answers to which might overturn a presumption in favour of some means of achieving one's goal but would not be required to establish the presumption in the first place. These possible changes suggest some continuity between the present proposal of a general and

idealized scheme for means-end reasoning and various bounded rationality models of the same phenomenon. Unfortunately, the present author is constrained by resource limitations to leave to others the work of exploring this continuity and the implications of the proposed scheme for work in computer science.

An abstract and high-level reasoning scheme for solo means-end reasoning like the one just proposed is perhaps not of much direct use as a guide to real-life decision-making. It may be of most use as a guide for the formulation of lower-level domain-specific reasoning schemes. And no doubt it is subject to counterexamples that can be an occasion for further refinement.

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Chapter 16
Appeals to Considerations

Abstract Following Wellman, Trudy Govier has developed a comprehensive approach to the analysis and evaluation of what she calls "conductive arguments". There is indeed a distinct form of reasoning and argument of the sort Wellman and Govier describe, but both the label 'conduction' and the common metaphor of weighing up the pros and cons are misleading. The form of reasoning and argument is better described as an appeal to considerations (or to criteria). The considerations cited are features of a subject of interest, and the conclusion drawn from them is the attribution of some supervenient status to that subject, such as a classification, an evaluation, a prescription or an interpretation. The conclusion of such reasoning may follow either conclusively from its premisses or non-conclusively or not at all. Weighing the pros and cons, however construed, is only one way of judging whether the conclusion follows, and perhaps only a last resort in making such judgments. Further, the move from information about the subject's cited features to the attribution of a supervenient status is often but one moment in a more complex process, a move that is typically preceded by other reasoning moves and may be followed by still others. In a thorough discussion of the supervenient status of such a subject, the relevant considerations and counter-considerations would ideally be integrated in such a way as to take the sting out of the counter-considerations.

16.1 Introduction

In his *Challenge and Response: Justification in Ethics*, Wellman (1971) distinguished what he called "conduction" from deduction and induction. "Conduction," he wrote,

> can best be defined as that sort of reasoning in which 1) a conclusion about some individual case 2) is drawn non-conclusively 3) from one or more premisses about the same case 4) without any appeal to other cases. (p. 52)

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Trudy Govier has done more than any other person to publicize and develop Wellman's work on this form of reasoning. Since her brief review of Wellman's book (Govier 1979), she has written five articles about what she calls "conductive arguments" (1980,[1] 1987a, b, 1999, 2011), and has included successively longer treatments of them in each of the seven editions of her textbook (1985, pp. 259–261; 1988, pp. 247–253; 1992, pp. 308–316; 1997, pp. 388–408; 2001, pp. 392–412; 2005, pp. 393–415; 2010, pp. 352–377). From the fourth edition (1997) on, they have been the main subject of a separate chapter entitled "Conductive arguments and counterconsiderations". It is a safe guess that so far no other introductory textbook has devoted nearly as much attention to this type of argument.

In this chapter, I use Govier's comprehensive treatment of conductive arguments as a foil for developing what I take to be a more adequate approach to the analysis and evaluation of this sort of reasoning. My thinking owes much to the collection of essays on conductive argument (Blair and Johnson 2011) that emerged from a conference on the topic at the University of Windsor in 2010.

16.2 Some Examples

It is important in theorizing about reasoning and argument to keep one's eye on real examples of the phenomenon one is theorizing about. By real examples, I mean either discursive thinking about some question at issue or communication of such thinking to others (interactively or not, with a view to persuasion or revelation or any other end). Real examples contrast with artificial examples invented by a textbook writer or scholar to illustrate a phenomenon. Artificial examples may be realistic, but we do not know whether they are until we compare them to real examples. The danger of theorizing on the basis of artificial examples is that we tailor our examples to our theoretical proclivities rather than tailoring our theorizing to the phenomenon we wish to understand. Allowance should be made, of course, for the possibility that real reasoning and argument have been shaped, for good or ill, by past theorizing to which the reasoner or arguer has been exposed.

To provide a focus for the present reflection, I shall be referring to what I take to be paradigm real cases of the phenomenon that Govier has done so much to help us understand. The cases are collected in the appendix to this chapter. They consist of five passages that Govier quotes in support of her claim that arguments of this sort occur (1999, pp. 160–166) and seven passages on the Web discovered in Google searches using the exact phrases "taking all these factors into account" and "therefore on balance". The passages give a sense of the range of types of judgments for which one can argue "conductively". Five are classifications, two are evaluations, two are recommendations, and there is one interpretation, one decision, and one causal claim.

[1]Here and in the rest of this article citations whose author is unnamed are to Govier's publications listed in the references.

The reader can find additional real examples in the two samples of arguments and inferences in (Hitchcock 2002, 2009), where they are classified under the labels "classification by criteria", "evaluation by criteria", "prescription by criteria", "pros-and-cons decision-making", and "pros-and-cons evaluation". In the sample taken from books in the library of a research-intensive university (Hitchcock 2002), more than a quarter of the arguments and inferences (28%) were classified by these labels, with the most common form of argument by far (22%) being evaluation by criteria. In the sample taken from phone calls to radio talk shows (Hitchcock 2009), 49% of the arguments and inferences were classified by these labels, with the two most common types of reasoning in the sample being prescription by criteria (33%) and evaluation by criteria (13%). The high frequency indicates that so-called conductive reasoning is widespread. It therefore deserves theoretical attention.

The reader can also find what I take to be an extended example of such reasoning (65 pages long) in a recent decision by the Supreme Court of Canada[2] on the question of whether a witness who wishes on religious grounds to keep her face covered with a *niqab* (i.e. a face veil) should be required to remove it during her testimony.

16.3 Definition

Govier understands conductive arguments as "arguments in which premisses are put forward as separately and non-conclusively relevant to support a conclusion, against which negatively relevant considerations may also be acknowledged" (2011, p. 262). This definition differs from Wellman's in two respects. First, it drops the condition that the premisses, counter-considerations if any, and conclusion concern an individual case, with no appeal to any other cases. Govier has always omitted this condition from her general descriptions of conductive arguments. She defends the omission on the ground that "it is easy to think of examples where separate facts are cited to nonconclusively support generalizations" (1987a, p. 69). As her own example of this sort of argument, she gives the apparently invented and rather simplistic argument: "Blacks are equal to whites because they are as healthy as whites, they are biologically very similar to whites, they are as intelligent as whites, and they share basic needs with whites." (1987a, p. 69)

The second respect in which Govier's 2011 definition differs from Wellman's is in its shifting of the claimed non-conclusiveness of such arguments from the entire inference to the bearing of each supporting reason separately on the conclusion. The same shift occurs in the seventh edition of her textbook, where a footnote makes clear that an argument with several premisses that each separately deductively entail the conclusion would not be conductive (2010, p. 376, n. 2; cf. 1987a, p. 70).

[2]R. *v.* N.S., 2012 SCC 72. The decision is available at: http://www.canlii.org/en/ca/scc/doc/2012/2012scc72/2012scc72.html; accessed 2016 08 09.

Govier notes (2010, p. 355) that an arguer who strongly acknowledges counter-considerations implicitly puts forward the conclusion as not conclusively established. Strong acknowledgement is admission that relevant considerations count against the conclusion, as opposed to weak acknowledgement that someone else might think, perhaps falsely, that there are such counter-considerations. The existence of relevant counter-considerations does indeed imply that the premisses collectively do not conclusively establish the conclusion, since conclusive support would deprive other features of the matter at issue of any negative relevance. As to conductive arguments without counter-considerations, Govier has stated explicitly that a conductive argument "differs from a deductive argument because the factors cited do not entail, and are not put forward as being sufficient for, the conclusion cited" (1987a, p. 66; cf. 1999, p. 155); in this context, "being sufficient for" should be understood in a strict sense of "being conclusive support for". In her textbook she has retained the condition that the premisses do not collectively entail the conclusion (e.g. 1985, p. 260; 1988, p. 348; 1992, p. 308; 1997, p. 388; 2001, p. 392; 2005, p. 393; 2010, p. 352) and has not retracted the condition that the factors cited are not put forward as entailing the conclusion.

Thus Wellman makes it a condition for reasoning to be conductive that the reasoner draws the conclusion non-conclusively (Wellman 1971, p. 52). And, similarly, Govier makes it a condition for an argument to be conductive that the arguer does not put forward the factors cited as sufficient for, i.e. conclusively supporting, the conclusion cited (Govier 1987a, p. 66; 1999, p. 155). But, as has been argued in the case of attempts to classify reasoning and argument as deductive or inductive, such appeals to the intentions or claims or beliefs of reasoners and arguers are vacuous in many cases and are unnecessary for argument appraisal (Hitchcock 1980, 1981; Ennis 2001; Goddu 2001). As one can confirm for oneself by immediate retrospection, reasoners who draw a conclusion for themselves from information at their disposal are typically unaware of whether they are drawing it conclusively or non-conclusively. Reasoners just draw their conclusions, and it is only after that inferential act, if at all, that they determine whether their conclusion follows conclusively or non-conclusively. As for arguers, they sometimes claim a qualitative degree of support for their conclusion by qualifying it with terms like 'must' or 'probably' or 'presumably' or 'may'. But they do so in a minority of cases. For example, in a sample of 37 arguments or inferences made by callers to radio talk shows (Hitchcock 2009), 15 had a qualified conclusion, but eight of the 15 qualifiers were either 'I think' or 'I really think' or 'I believe', apparent indicators of hesitation or modesty rather than of the claimed strength of the inferential support. (There were three indicators of conclusive support ['you've gotta', 'it's not possible that', 'they found out that'] and four indicators of what we might call conjectural support ['I guess', 'my suggestion would be', 'it would make sense that', 'maybe'].) In a sample of 50 arguments or inferences in English-language books in the library of a research-intensive university (Hitchcock 2002), only five had a qualified conclusion, with three qualifiers ('must', 'implies that', 'obviously') indicating conclusive support and two indicating conjectural support ('suggests that', 'seems to'). Without an explicit claim of the degree of inferential support, an

argument analyst is merely guessing when attributing to the arguer a specific intention or belief about that degree. It makes sense to avoid such guessing, take the argument as stated, and simply determine how if at all the conclusion follows (Ennis 2001). Appraisal of the inference from premisses to conclusion does not require attribution to the arguer of a claim or intention or belief about the strength of inferential support.

In particular, in the five examples of Govier's in the appendix, only two qualify their conclusions, one with the phrase 'there is no doubt that' (presumably indicating claimed conclusive support) and the other with the phrase 'usually' (reflecting perhaps acknowledgement that in a minority of cases where parents deceive their children about Santa Claus either not all the cited factors obtain or there are other overriding factors). The seven other examples were selected by means of the qualification of their conclusion by the phrase 'taking all these factors into account' or the phrase 'therefore on balance', but neither of these qualifiers implies that the inferential support is being presented as non-conclusive. Reasoners and arguers who think that they have taken all the relevant factors into account may well think that the position inferred follows conclusively from the reasons used to arrive at it in the light of any acknowledged counter-considerations.

If we drop the condition that conductive reasoning requires awareness that the premisses do not support the conclusion conclusively and conductive argument requires a claim to that effect, we are left with the definition of conduction either as reasoning from one or more premisses about an individual case to a conclusion about that same case (Wellman) or as argument in which premisses are put forward as separately relevant to support a conclusion, possibly with acknowledgement of negatively relevant counter-considerations (Govier). No appeal to possibly indiscernible and possibly non-existent intentions or beliefs is required to take an arguer to put forward premisses as relevant or to acknowledge counter-considerations as negatively relevant. For the mere fact of using a statement as a reason for accepting a conclusion implicitly claims that the reason is relevant, i.e. useful in the context for showing that the conclusion is true or otherwise worthy of acceptance. Likewise, the mere fact of introducing a statement in the context of an argument with a concessive conjunction like 'even though' or 'although' or 'notwithstanding the fact that' amounts to a claim that the factor described in the statement is negatively relevant to the conclusion. However, arguers do not always signal whether they take their supporting reasons to be *separately* relevant; further, if an indicator like 'moreover' or 'also' or 'besides' or 'further' introduces an additional supporting reason, it requires interpretation to determine whether the author intends the new reason to be sufficient on its own to support the conclusion (as is often the case, for example, in Aristotle's writings) or to combine with the previous reason to support the conclusion in a single inference. Further, some arguments that Govier wants to classify as conductive have just one premiss, in which case the condition of putting forward each reason as separately relevant is not met. It must be admitted, on the other hand, that all 12 examples of conduction in the appendix indicate in one way or another that the reasons offered in support of the conclusion are separately relevant.

If we delete from Govier's definition the condition that the arguer puts forward each reason as *separately* relevant, we get a definition of a conductive argument as an argument in which one or more reasons are put forward as relevant to a conclusion, with the possibility that negative considerations may be acknowledged. This definition is much too broad, since it fits for example each of the following (invented) arguments, which on their face appear quite unlike any of Govier's examples:

(1) In each of the past 20 years, the maple tree in my garden has produced leaves in the spring. So it will produce leaves this coming spring. [One could split the single premiss into 20, one for each of the 20 years, to get a multi-premiss argument.]
(2) Every maple tree that I have observed in the winter in northern latitudes has shed its leaves. So probably all maple trees in northern latitudes shed their leaves in the autumn. [Again, one could split the single premiss into a large number of premisses, one for each maple tree observed.]
(3) Black oaks, bur oaks, cherrybark oaks, laurel oaks, white oaks, overcup oaks, post oaks and pin oaks are deciduous. So, even though live oaks are evergreen, probably most species of oaks are deciduous. [The premiss is a conjunction with eight conjuncts, each of which could be expressed as a separate premiss. And a counter-consideration is acknowledged.]
(4) Sunlight reaching the Earth is made up of all the colours of the rainbow. When sunlight reaches the Earth's atmosphere, the gases and particles in the air scatter it. The fact that blue light has shorter, smaller waves than other colours of light causes gases and particles in the air to scatter it more than those other colours. Therefore, the reason why a cloudless sky during the middle of the day is blue is that gases and particles in the air scatter the blue light in the sunlight reaching the Earth more than other colours of light.
(5) Susan is a few days late with her period. Her period usually comes at regular intervals. Susan has experienced slight spotting, but much less bleeding than she usually gets with her period. She has also experienced slight cramps, but again much less than the cramps that she usually gets with her period. She has also noticed a milky discharge from her vagina. She had intercourse within the last two weeks. So, although her breasts have not become tingly and her areola has not darkened, probably Sue is pregnant.
(6) Jupiter's moon Europa has water on it, just like Earth. Its surface is silicate rock, of a type found on the surface of the Earth. So, even though it is much colder than Earth, there may be life on Europa.

Argument (1) is an *inductive extrapolation* from past behaviour to future behaviour, similar in structure and criteria of appraisal to extrapolations of a property from all observed individuals of some species or genus to another individual of the same kind. Argument (2) is an *inductive generalization* from observed individuals of a kind to all individuals of that kind. Argument (3) is a *qualitative statistical generalization* from the distribution of a property in a sample of individuals of some kind (here individual species of a genus) to its distribution among all individuals of the kind. Argument (4) is an *inference to a causal explanation* from a series of causal processes involved in the production of an observed phenomenon. Argument (5) is mostly an *argument from sign*, which reasons from a collection of symptoms to a common cause that would explain them all; the premiss that Sue had intercourse in the last two weeks provides a plausible causal pathway for the production of the apparent common cause of her symptoms. Argument (6) is an argument by analogy.

Each of the six arguments is of a type that has distinctive criteria of appraisal, unlike those one would be inclined to propose for conduction; further, they seem on their face unlike the paradigm cases of conductive arguments in the appendix. How can we narrow down Govier's truncated definition of conductive arguments so that it excludes arguments of these rather different types? Restoring the problematic conditions of presenting the reasons as separately relevant and jointly inconclusive will not help. For five of the six arguments just presented—all of them except argument (4)—can plausibly be interpreted as presenting their reasons as separately relevant and jointly inconclusive.

In dropping Wellman's condition that conductive reasoning be about an individual case, with no reference to other cases, Govier appears to have thrown out the baby with the bath-water. Even though the subject of conductive argument may be a general policy rather than an individual case, the examples that she cites have a common structure in which the premisses and counter-considerations if any mention features of a single subject of interest and the conclusion attributes a further property to that same subject. Her counterexample of a four-premiss argument that blacks are equal to whites, for instance, has as a shared subject of interest the ordered pair <blacks, whites>; the conclusion attributes to this ordered pair the property of being equal to on the basis of four features of the pair. The 12 examples in the appendix have as their subjects of interest (the topic shared by each premiss and by the conclusion) the plot of *Wuthering Heights*, the sentence 'this exists' said of a sense-datum of which the speaker is directly aware at the time of utterance, the Santa lie, Trabbe Johnson's lifestyle, an annual conference scheduled for Atlantic City soon after Hurricane Sandy struck the New Jersey coast, voice recognition software, national risk registers, a resort hotel in the Yucatan Peninsula, a proposal for backloading in the European Union's emission trading scheme, two problematic spindle cell sarcomas, and a proposed option for international criminal health checks. Each argument cites features of the subject of interest that count for, and in some cases against, the conclusion drawn. Thus the abstract form of a conductive argument is as follows, where the 'even though' clause may be empty: $<x_1,\ldots, x_m>$ has features $F_1,\ldots, F_n$; therefore, even though $<x_1,\ldots, x_m>$ has features $H_1,\ldots, H_k$, $<x_1,\ldots, x_m>$ is G. See Freeman (2011, p. 128).

Adding to Govier's truncated definition the requirement that the argument have the just-mentioned abstract form will automatically exclude from the class of conductive arguments all but one of the six types illustrated by arguments (1) through (6): inductive extrapolations and generalizations, statistical generalizations, arguments from underlying cause-effect relationships to the causal explanation of some phenomenon, arguments by analogy. It does not rule out arguments from sign like argument (5). Nor does it rule out arguments from possession of a complex property to possession of one of its alleged constituents, as in the (invented) argument, "Jones is a bachelor, so Jones is unmarried."

What distinguishes conductive reasoning and argument from arguments from sign and arguments from complex properties to their simple constituents is that the conclusion of conductive reasoning or argument attributes a supervenient status to the subject of interest, on the basis of factors that the reasoner takes to count for or

against its having that status. The reasoner takes the status to be constituted by a complex of types of considerations, and to be incapable of varying independently of them. Passage 9 in the appendix is typical: whether the resort hotel under review is worth going back to does not vary independently of its setting, the cleanliness of the beach, and the other factors mentioned by the reviewer—whose presence or absence, perhaps in combination with other unmentioned factors, she takes to be constitutive of whether a resort hotel is good enough to go back to. In contrast, arguments from sign are not arguments for some supervenient status based on allegedly relevant considerations and counter-considerations. They are arguments for some supposed cause, whose presence is in principle independently determinable, in example (5) above by a pregnancy test, and which is not prevented by conceptual or normative constraints from varying independently of the cited signs and symptoms (in the sense that two women could share the cited signs and symptoms even though one is pregnant and the other is not, and even though they do not differ with respect to any other sign or symptom of pregnancy). Similarly, marital status does not supervene on bachelorhood but is a definitional component of it. (Admittedly, a person's marital status does supervene on other facts about their history and cannot vary independently of such facts. So there can be conductive arguments that a person is unmarried, based on premisses about the person's life history.)

Thus, we can define conductive reasonings and arguments as those in which a supervenient status is attributed to a subject of interest on the basis of one or more features of that subject, with possible acknowledgement of features that count against the attribution. The subject may be a class rather than a first-order entity, and it may be an ordered *n*-tuple (pair, triple, etc.) rather than an individual. The supervenient status will typically be evaluative, prescriptive, interpretive or classificatory.

Such reasoning can be deductively valid, in the broad sense that the meaning of its constituents rules out the possibility of true premisses and a false conclusion. For some criteria of classification, evaluation, decision-making or interpretation are conclusive. For example, if one accepts the contemporary zoological definition of a reptile as an amniote vertebrate descended from the most recent ancestor of living turtles, crocodilians and lizards,[3] one will take the claim that birds are reptiles to follow deductively from the fact that birds are vertebrates, are suspended in a membrane in their embryonic stage, and are descended from the most recent ancestor of living turtles, crocodilians and lizards.

It also worth noting that introduction of a conclusion by the phrases "taking all these factors into account" or "therefore, on balance" does not necessarily signal conductive reasoning. Among the examples turned up in a search using the phrase "taking all these factors into account" was an argument predicting an effect on the

[3]Darren Naish, "What is the definition of 'reptile'?", *Ask a Biologist* (http://www.askabiologist.org.uk/answers/viewtopic.php?id=855; accessed 2012 12 06).

basis of alleged causal factors. This piece of reasoning did not involve appeal to allegedly constitutive factors to support attribution of a supervenient status. Arguments of this sort, which reason from one or more causally relevant factors to a predicted effect, postulate a cumulative causal influence that is quite different from the cumulative contribution of features of a case to its interpretation, evaluation, classification, or policy decision. For one thing, with the passage of time it can become clear quite independently of any causally relevant factors whether the predicted effect occurs, whereas the correctness of an interpretation, evaluation, classification or policy decision cannot be judged independently of the sorts of considerations adduced in conductive reasoning to support it. For another thing, the causal relevance of a factor to a possible effect is established in a different way than the constitutive relevance of a factor to some supervenient status; in the former case one needs to appeal to empirically derived information about mechanisms of influence and underlying structural determinants, but in the latter case one needs to think in a more a priori fashion about what counts for or against the supervenient status in question. Yet another difference between the two types of reasoning is that assigning a supervenient status to a case on the basis of relevant and cumulative considerations often involves consideration of one or more rival supervenient statuses (other possible interpretations, other possible policy decisions), whereas predicting an effect on the basis of causally relevant factors typically is more linear and less attuned to rival predictions.

Similarly with the phrase "therefore, on balance". Among the examples turned up in a search using this phrase was an argument that a positive test result for antibodies to HIV (the virus that causes AIDS) was "on balance" probably a false positive because of an inquirer's low antecedent risk of exposure to the virus. The "balancing" in this case involved a calculation using Bayes' theorem, that the posterior probability of a hypothesis (HIV infection in this case) given new evidence (the positive test result) is its prior probability (before the new evidence became available) times the ratio of the likelihood of the evidence if the hypothesis is true to its likelihood if the hypothesis is false[4]; given a low prior probability, the posterior probability will be low even if a positive test result is more likely when a test subject has an HIV infection than when they do not. Calculations of this sort are quite different from judging the comparative contribution of positively relevant and negatively relevant factors to the assignment of some supervenient status.

Thus neither the abstract form 'x has features $F_1,\ldots, F_n$; therefore, x is G' nor indicator phrases like 'taking all these factors into account' and 'therefore on balance' distinguish conduction from other kinds of reasoning; the abstract form is a necessary but not sufficient condition for conduction, and the indicator phrases are suggestive but neither necessary nor sufficient.

[4]*Added in the present republication*: The prior probability and the posterior and prior likelihoods are to be calculated with reference to the total evidence at the disposal of the person doing the calculation.

16.4 Name

Govier has defended the use of the name 'conductive arguments' in preference to the names that others have given to such arguments: 'cumulation of consideration arguments', 'balance of consideration arguments', 'good reasons arguments' (2010, p. 353). To the name 'good reasons arguments' adopted by Baier (1958, p. 39), Govier objects that sometimes the reasons in arguments of this kind are not good, either because they are individually irrelevant to the conclusion or because they are collectively insufficient to support it (2010, p. 353). One might also note that the name 'cumulation of consideration arguments' fits cases where more than one supporting reason is provided, but does not fit cases like passages 2 and 12 in the appendix, where there is only one supporting reason. The name 'balance of consideration arguments' fits only conductive arguments where counter-considerations are strongly acknowledged, and is thus inappropriate as a name for the whole class of conductive arguments. Names like 'pro and contra argumentation', derived ultimately from the work of Naess (1966), are misleading for the same reason, and also have the disadvantage of including cases like the consideration of arguments for and against the existence of God, which neither Govier nor Wellman would want to include in the class of conductive arguments. A name that picks out the most salient feature of the definition just developed is 'appeal to considerations' or 'appeal to criteria', provided that one takes the plural of 'considerations' and 'criteria' to include the singular. 'Appeal to one or more considerations or criteria' gives the clearest sense of the type of reasoning and argument, but is wordy.

16.5 Structure

Govier declares that the support for the conclusion of a conductive argument is "always convergent" (2010, p. 352). She oscillates in her description of what convergent support amounts to between a characterization in terms of the way the author presents the argument and a characterization in terms of the substantive relationship of the individual reasons to the conclusion (p. 352; cf. her 1999, p. 156). On the first characterization, support is convergent if and only if the reasons are *put forward as* separately relevant to the conclusion. On the second characterization, support is convergent if and only if the reasons are *actually* separately relevant to the conclusion, in the sense that each of them counts separately for the conclusion: "If one or more premisses were to be removed from the argument, the relevance to the conclusion of the remaining premisses would be unaffected." (2010, p. 352). Since Govier allows that some conductive arguments may contain irrelevant premisses that are falsely put forward as relevant, she ought to prefer the first characterization in terms of how the premisses of a conductive argument are presented. However, as previously noted, it may be hard, or even impossible, to tell whether reasons offered as a basis for attributing a supervenient status are presented

as separately relevant. The first passage in the appendix, for example, cites three features of the plot of *Wuthering Heights* in support of the claim that the entire plot has a vague incestuous aura without indicating in any way their separate relevance to the conclusion.

Through all seven editions of her textbook, Govier has represented conductive arguments diagrammatically with a separate line with an arrow at its end going from each premiss or counter-consideration to the conclusion—a straight line from each premiss and a wavy line from each counter-consideration. This diagram makes visual her view that authors of conductive arguments represent each premiss as separately relevant to the conclusion and each strongly acknowledged counter-consideration as separately negatively relevant. But it fails to represent the "leading together" of the positively relevant and negatively relevant considerations which is the basis of applying the term 'conductive' to such arguments. At a conference on conductive arguments at the University of Windsor in 2010, Hansen (2011) and Jin (2011) among others raised questions about this failure, particularly in cases where counter-considerations are acknowledged in an 'although' or 'even though' clause and there is an implicit so-called "on-balance premiss" that the positive reasons outweigh the (strongly) acknowledged counter-considerations. To accommodate the failure, Govier proposes to add to her textbook diagram two lines of text between the converging arrows and the conclusion, the first with the on-balance premiss and the second with the word 'therefore' (2011, p. 275).

Govier thus supposes that the author of a conductive argument makes one more inference claim than the sum of the number of premisses put forward as positively relevant and the number of strongly acknowledged counter-considerations. For each premiss, the author claims independent positive relevance (helping to support the conclusion, quite independently of any other premiss). For each strongly acknowledged counter-consideration, the author claims independent negative relevance (helping to reject the conclusion, quite independently of any other counter-consideration). And the author claims that the conclusion follows, perhaps defeasibly rather than conclusively, from the stated premisses, even when one takes the strongly acknowledged counter-considerations into account. Thus, if the argument has three premisses and acknowledges two counter-considerations, the author makes six inference claims: three of positive relevance for each of the three premisses, two of negative relevance for each of the two counter-considerations, and one of adequacy of support for the three premisses as a group even when one takes into consideration the strongly acknowledged counter-considerations.

Despite its proliferation of targets for evaluation, this analysis seems to have much to be said for it. In order to appraise thoroughly an attribution of a supervenient status to a subject of interest on the basis of one or more of its alleged features, we need to determine whether each feature has any bearing on the supervenient status, and if it does whether the subject of interest really has the feature it is stated to have. Only after this initial check on the independent relevance of each feature cited, and on the acceptability of each claim that the subject of interest has that feature, can one determine whether the acceptable and independently relevant features on balance provide sufficient support for attributing the supervenient status.

16.6 Scope

What kinds of judgments can be supported by conductive arguments? From the beginning (1979, p. 12), Govier has emphasized the wide variety of judgments for which people argue conductively, not just:

> particular moral judgments about individual cases (on which Wellman focused)

but also judgments of the following types:

> aesthetic judgments, such as the judgment that a particular book is not a good one (1979, p. 12–an invented example taken from Wellman)
>
> interpretive judgments, such as the judgment that Emily Bronte casts a vague incestuous aura over the entire plot of *Wuthering Heights* (1987a, p. 71; repeated in 1999, p. 165–an actual example taken from a scholarly article on the incest theme in *Wuthering Heights*)
>
> classificatory judgments, such as the judgment that Hume is not a sceptic (1979, p. 12; repeated in 1987a, p. 68–an example invented by Govier, but in my judgment a realistic one) or the judgment that the Santa Claus story told to children is not a deeper truth but usually a white lie (1999, pp. 160–161–two real examples)
>
> evaluative judgments about particular cases, such as the judgment that one's lifestyle is not environmentally pure (1999, pp. 161–162–a real example)
>
> judgments about philosophical concepts, such as the judgment that the sense-datum corresponding to the observed surface of an object either is usually not identical with that surface or usually lacks the qualities it is sensed as having (1987a, p. 72; repeated in 1999, p. 163–an argument put forward by John Wisdom) or the judgment that the sentence 'this exists' has meaning when the word 'this' is used of something with which we are immediately acquainted at the time the sentence is uttered (1987a, p. 72–a real example put forward by G. E. Moore)
>
> policy recommendations, such as the judgment that assisted euthanasia should not be legalized (1970, p. 3–a rather simplistic example invented by Govier) or the judgment that voluntary euthanasia should be a legal option for the terminally ill patient (1985, p. 261; 1988, p. 249; 1992, pp. 310–311; 1997, p. 393; 2001, p. 397; 2005, p. 398; 2010, p. 360–a somewhat less simplistic example, also invented by Govier, and discussed by her with increasing detail in successive editions of her textbook) or the judgment that tailoring sentences of convicted criminals to the particular facts of each case is highly impractical (1999, p. 164–a real example)
>
> judgments that a hypothesis or theory under consideration is the best available explanation of a given set of facts (2010, p. 354; 2011, p. 263)
>
> judgments about general causal relationships, such as the judgment that rape is not due to natural psychological impulses (1999, p. 162–a real example) or the judgment that solving the problems of humanity requires not just application of the physical and biological sciences but also vast changes in human behaviour (1999, p. 163–a real example, put forward by B. F. Skinner) or the judgment that punishment will make the criminal more morally sensitive (1999, p. 165–a real example) or the judgment that the main beneficiaries of programs to combat global warming will be the developing countries (1999–p. 166-a real example)
>
> economic forecasts, such as the judgment that America has turned the corner on the depression of the last few years (1979, p. 12; repeated in 1987a, p. 71–an invented example taken from Scriven)

Since causal relationships and future economic performance are not supervenient statuses, the definition proposed in this chapter of conductive arguments as appeals to considerations or criteria in support of a supervenient status would exclude the last two groups of arguments from the class of conductive arguments.

What about the process leading up to the construction of a conductive argument? Govier occasionally acknowledges (e.g. at 1979, p. 14) that the utterance or inscription of a conductive argument may be the result of a prior process that includes things like sifting through evidence and trying to determine what is relevant. But she regards this process as a matter of reasoning rather than argument, presumably on the basis that it involves intra-personal thinking rather than inter-personal communication. She does not mention the possibility that the preliminary process may also involve inter-personal communication. Nor does she discuss the possibilities of inter-personal communication in the critical reaction and response to a conductive argument, as might occur for example when a judge writes a dissenting opinion in response to a conductive argument of the majority in a legal case. In her response to the papers at the 2010 symposium, she explains her reticence as due to a focus on brief arguments on such matters as whether to rent an apartment or hire one babysitter rather than another (2011, p. 266). She acknowledges there that on substantial public issues such as capital punishment or abortion the considerations in a conductive argument tend to be the result of prior debate and argumentation, and "there is a certain dynamism" (2011, p. 266) in which back-and-forth discussion and recognition of counter-considerations may lead one to qualify an initial position. She does not however address the arguments of Wohlrapp (2008, 2011, 2014) that her conductive argument scheme developed from Wellman's ideas is "a misleading model for the analysis of pro- and contra-argumentation" (Wohlrapp 2011, p. 210).

16.7 Evaluation

Govier's analysis of the structure of conductive arguments leads naturally to her position on how they should be evaluated. She sets out "the questions to be asked in evaluating conductive arguments" (1999, p. 169) quite succinctly in *The Philosophy of Argument*:

1. Are the premisses rationally acceptable?
2. Is each premiss, considered by itself, relevant to the conclusion?
3. How strong a reason does each relevant premiss provide for the conclusion?
4. Considering all the supporting premisses together, how strong is the support provided for the conclusion?
5. What are counter-considerations (strongly acknowledged by the arguer) that count against the conclusion?
6. What are the counter-considerations put forward by the evaluator or critic that count against the conclusion?
7. How strong is each of these counter-considerations as a reason against the conclusion?

8. How strongly do the counter-considerations, taken together, count against the conclusion?
9. Taking into account the deliberations at stages (4) and (7),[5] how much support overall, or on balance, is provided for the conclusion by the premisses? (1999, p. 170)

The judgment that a conductive argument is cogent, she claims, implies that on balance the pros outweigh the cons to a sufficient degree that there are good grounds for the conclusion. The sufficiency here must be sufficiency in a weak sense compatible with non-entailment of the conclusion by the premisses.

A similar but more concise list, in the form of instructions rather than questions, and including the conditions for summative judgments of cogency or non-cogency, appears in the second (1988) through the seventh (2010) editions of her textbook:

1. Determine whether the premisses offered to support the conclusion are acceptable.
2. Determine whether the premisses offered to support the conclusion are positively relevant to it, *and assess the strength of the reasons*. [italicized words added from the fourth (1997) edition on–DH]
3. Determine whether any counterconsiderations acknowledged by the arguer are negatively relevant to the conclusion.
4. Think what additional considerations, not acknowledged by the arguer, are negatively relevant to the conclusion.
5. Reflect on whether the premisses, taken together, outweigh the counterconsiderations, taken together, and make a judgment. Try to articulate good reasons for that judgment.
6. If you judge that the premisses do outweigh the counterconsiderations, you have judged that the (R) and (G) conditions are satisfied. Provided that (A) is also satisfied,[6] you deem the argument cogent. Otherwise, you deem it not to be cogent. (1988, pp. 249–250; 1992, pp. 311–312; 1997, p. 397; 2001, pp. 401–402; 2005, p. 405; 2010, pp. 365–366)

This approach to evaluating a conductive argument is highly atomistic. It requires (explicitly in the 1999 list of questions, implicitly in the textbook list of instructions) separate judgments, using at least a rough cardinal measure, of the strength of support provided by each (rationally acceptable) premiss, the strength of support provided by those premisses collectively, the strength of opposition provided by each counter-consideration, the strength of opposition provided by the counter-considerations collectively, the difference between the collective strength of support from the premisses and the collective strength of support provided by the counter-considerations, and the degree of support that is sufficient to provide good grounds for the conclusion. Evaluation of a conductive argument with three

[5] '(7)' here looks like a misprint for '(8)'.

[6] *Added in the present republication*: The (R) conditions are the conditions that the premisses of a cogent argument must be relevant (R) to the conclusion, in the sense they provide some evidence for it. The (G) condition is the condition that considered together the premisses must provide adequate grounds (G) for accepting the conclusion. The (A) condition is the condition that the premisses of a cogent argument must be acceptable (A), in the sense that it is reasonable for the person to whom the argument is addressed to accept them. Govier takes the ARG conditions to be individually necessary and jointly sufficient for an argument to be cogent, in the sense of being rationally compelling.

supporting premisses, one strongly acknowledged counter-consideration and one unacknowledged counter-consideration identified by the evaluator, would require nine distinct quantitative judgments, each presumably fallible or even necessarily subjective, with a concomitantly high risk of an error of judgment about the cogency of the argument. (Parenthetically, it should be noted that Govier has omitted one relevant evaluative question, namely, whether it is rational to accept that each of the strongly acknowledged counter-considerations in fact obtains.)

Further, and more significantly, Govier's approach to evaluating conductive arguments is exclusively product-oriented, i.e. oriented to the premiss-conclusion structure of the finished argument to be evaluated. It makes no allowance for a discursive process, either by a single evaluator or in back-and-forth discussion, in which one considers modifying the way the question at issue is framed, the criteria or considerations that are deemed relevant, and the priority to be given to one factor in relation to another. This sort of process, to whose understanding significant contributions have been made by Wohlrapp (2008, 2011, 2014), by Bailin and Battersby (2010) and by Battersby and Bailin (2011), and of which Fred Kauffeld has given a fine analysis in his brief case study of the debates in 1787 and 1788 over ratification of the United States Constitution (Kauffeld 2011), is particularly salient in the discussion of public policy issues to which Govier wishes to extend Wellman's framework.

In all seven editions of her textbook, Govier explains how one is to appraise a conductive argument with reference to an apparently invented example of an argument that voluntary euthanasia should be a legal option for the terminally ill patient:

> (1) Voluntary euthanasia, in which a terminally ill patient consciously chooses to die, should be made legal. (2) Responsible adult people should be able to choose whether to live or die. Also, (3) voluntary euthanasia would save many patients from unbearable pain. (4) It would cut social costs. (5) It would save relatives the agony of watching people they love die an intolerable and undignified death. Even though (6) there is some danger of abuse, and despite the fact that (7) we do not know for certain that a cure for the patient's disease will not be found, (1) voluntary euthanasia should be a legal option for the terminally ill patient. (1985, p. 261; 1988, p. 249; 1992, pp. 310–311; 1997, p. 393; 2001, p. 397; 2005, p. 398; 2010, p. 360)

The choice of example is unfortunate. It is a bare-bones and simplified, even simplistic, argument on a major sensitive and controversial matter of public policy. As such, it has no chance of being a cogent, i.e. compelling, argument. If this argument were the whole of an undergraduate student's essay on the issue, it would get a very low grade from any conscientious and capable marker. If it were the whole statement of a witness appearing before a legislative committee holding hearings on the proposed legislation, the committee members would pepper the witness with questions. It is not surprising that, in his extensive critique of Govier's weight-and-sum approach to evaluating pro- and contra-discussion, Wohlrapp (2008, pp. 320–334; 2014, pp. 248–265) finds much to object to in her treatment of this example. Nevertheless, it serves as a starting-point for his own approach of

applying the concept of frames to a dynamic discussion of issues on which there is pro- and contra-argumentation.

We can extract from Govier's application of her atomistic and product-oriented evaluative procedure to her sample argument (2010, pp. 361–363) substantive guidelines for its application to other cases. She takes the relevance of a particular consideration to consist in a general principle that, other things being equal, if the consideration obtains, then the inferred status belongs to the subject at issue. For example, the relevance of cutting social costs—(4) in the passage quoted above—to the desirability of legalizing voluntary euthanasia (1) consists in the principle that, other things being equal, anything that cuts social costs should be legalized. A consideration should thus be deemed irrelevant if its corresponding general principle is rejected. A similar test can be applied to determine the negative relevance or irrelevance of any counter-considerations, whether acknowledged by the arguer or entertained by the evaluator.

As a basis for evaluating informally the strength of a reason judged relevant, Govier proposes the consideration of the range of exceptions covered by the *ceteris paribus* clause. Although she rightly judges it to be impossible to list all the other things that would have to be equal in the case of the social costs consideration, she takes that range to be wide, excluding for example cost-cutting that deprives people of needed services, is cruel, contravenes recognized human rights, or sacrifices something valuable. Hence, she concludes, cutting social costs is a comparatively weak reason for legalizing voluntary euthanasia. Without going through the specifics, she reports her conclusion from applying this informal procedure for evaluating the strength of a reason that the right of responsible adults to choose whether to live or die (2) is also a comparatively weak reason for legalizing voluntary euthanasia, but that saving many patients from unbearable pain (3) and saving relatives the agony of watching people they love die an intolerable and undignified death (5) are comparatively strong reasons.

Govier does not go through the analogous procedure for evaluating the strength of the acknowledged counter-considerations. One can conjecture that the strength of the danger of abuse (6) as a reason against voluntary euthanasia would depend according to Govier's procedure on the probable frequency of cases of abuse and the seriousness of the harm suffered in each such case; in other words, the counter-consideration would need to be fleshed out before we could judge the range of exceptional circumstances excluded by the *ceteris paribus* clause in the principle that, other things being equal, a practice with a risk of abuse should not be legalized. If we specify that the danger is a non-negligible frequency of people being put to death against their will, the range of exceptions would presumably be narrow, and the counter-consideration thus a comparatively strong one. As to the counter-consideration (7) that we do not know for certain that a cure for the patient's disease will not be found, here too more information is needed about how probable it is, given the available evidence, that a cure will be found before the terminally ill person dies from their illness.

In fact, the danger of abuse and the possibility that a cure for a terminal illness will be found would ordinarily be taken as reasons for qualifying a proposal to

legalize voluntary euthanasia, rather than as factors to be weighed in the balance against the reasons favouring legalization. For example, if one reads the Oregon Death with Dignity Act (Oregon 2011), one finds an elaborate set of conditions: who may initiate a request for life-ending medication and under what circumstances, the form of the written request, the responsibilities of the attending physician, confirmation by a second physician, possible referral of the patient for counseling, informed decision to receive the prescription, recommendation of family notification, repetition by the patient of the request, right of the patient to rescind the request, minimal time intervals between stages of the process, required documentation in the medical record, acceptable proofs of state residency, reporting requirements, effect of a request for life-ending medication on the construction of various legal documents (wills, contracts, statutes, insurance and annuity policies), prohibition of active euthanasia, immunities, liabilities, claims by governmental entities for costs incurred. It is obvious from reading the statute that it is the product of considerable back-and-forth discussion, with much attention to detail (including hypothetical scenarios, objections from opponents of the legislation before it was enacted, points raised in submissions from professional organizations and business groups, and the like). Enacting legislation on helping a terminally ill person to end their own life is and ought to be a much more complex matter than noting relevant supporting reasons for a proposed statute, acknowledging negatively relevant counter-considerations, summing up the total strength on each side, and determining whether the total strength of the supporting reasons is sufficiently greater than the total strength of the counter-considerations to constitute grounds for passage of the bill. Similarly for other controversial issues of public policy.

In her sketch of how to appraise the argument for legalizing voluntary euthanasia for terminally ill patients, Govier laudably notes that there may be unacknowledged counter-considerations to the conclusion, such as compromising the primary role of physicians as healers and savers of lives and the possible inability of people undergoing severe pain to make rational decisions about their lives. She does not mention a counter-consideration that is often overlooked in discussions of legalizing voluntary euthanasia or assisted suicide: the systemic effects of such legalization on socially accepted norms for decision-making by terminally ill patients.

Govier makes no attempt with this example to take the final steps of her recommended appraisal procedure: summing up the total strength of the stated reasons, summing up the total strength of the acknowledged and unacknowledged counter-considerations, calculating the difference, determining whether the difference (if it is positive) is big enough that the premisses provide sufficient grounds for accepting the conclusion, even in the light of the counter-considerations. It is hard to imagine what the application of these final steps to her example would look like. The difficulty of imagining it casts doubt on the applicability of her proposed method of evaluation. A convincing way to show that it is applicable would be to actually apply it to a real (i.e. not artificial) appeal to considerations in support of a supervenient status. And a convincing way to test its reliability (i.e. its tendency to lead to the same result when applied on different occasions to the same argument)

would be to measure its inter-rater reliability when applied by different trained evaluators to the same set of arguments.

In the most recent four editions of her textbook, Govier discusses the appraisal of one other conductive argument, generated from a real controversy over whether a university should block its students from using a university-provided account to access "extraordinarily explicit and brutal visual materials about bondage, bestiality, and sexual violence" available on the Internet (1997, pp. 396–397; 2001, pp. 400–401; 2005, pp. 402–404; 2010, pp. 363–365). She uses this example to warn against "tunnel vision", where one takes one relevant consideration (in this example that blocking student access would be a kind of censorship) as decisive, thus dismissing out of hand as irrelevant other factors in the situation (making university resources unavailable for academic work, making the university vulnerable to hostile external criticism, giving the impression that the university approved this material by making it available, intimidating women students if computers are left on showing pornographic material, possibly causing students to commit copycat offences). She points out quite rightly that taking the consideration that blocking such student access would be censorship as decisively settling the issue involves treating the argument as implicitly deductively valid, but that the implicit premiss required for such deductive validity (that all censorship is wrong) is not worthy of acceptance. Further, once the implicit premiss and the conclusion are appropriately qualified by a *ceteris paribus* clause, the considerations on the other side become relevant. Govier does not apply her appraisal procedure to an argument for or against blocking student access using university resources to pornographic material. She contents herself with remarking:

> There is no simple recipe for arriving at a definite answer in contexts like these. Decisions must emerge from our judgment about the strength of the reasons put forward, assessed in the light of counterconsiderations. To reflect on pros and cons requires good judgment, which you have to supply for yourself. (2010, p. 365; cf. 1997, p. 397; 2001, p. 401; 2005, p. 404)

Govier's procedure for evaluating appeals to considerations has become more ramified and sophisticated in successive editions of her textbook, and is arguably the most thorough such procedure in print. It is more generally applicable, for example, than Benjamin Franklin's rather similar "moral and prudential algebra", described in a letter to Joseph Priestley in 1772, of putting down in two lists all the pros and cons relating to some measure, striking out reasons on each side that seem of equal weight, finding where the balance then lies, and making a determination once some time for further consideration elapses during which no new important reason pro or con occurs to him (Franklin 1956/1772). But there is much to object to, with respect to both inclusions and omissions, in her appraisal procedure. Considering these objections and accommodating them can take us in the direction of a more adequate procedure.

An obvious objection is scepticism about our ability to measure the strength of each supporting reason and each counter-consideration. Govier herself remarks: "We cannot literally measure, or quantify, the strength or merits of the various

premisses against counterconsiderations." (1997, p. 392; 2001, p. 396; 2005, p. 397; 2010, p. 356) A detailed attempt to unpack the metaphor of the pros "outweighing" the cons has been made by Pinto (2011). He reports being unpersuaded by attempts like that of Pollock (1995, 2001) to assign real cardinal numbers to the strength of any argument or inference. Instead, Pinto assumes that "in most cases the best we can hope for is to make judgments about the *comparative* force or strength of individual considerations or sets of considerations". (Pinto 2011, p. 115; italics in original). Importantly, such comparative judgments, with respect to the set of supporting reasons and the set of counter-considerations, are enough to determine whether the supporting reasons are sufficient, in the light of acknowledged and unacknowledged counter-considerations, to justify acceptance of the conclusion. We don't need cardinal measures, just ordinal comparisons, perhaps with some rough sense of how much more weighty one consideration or set of considerations is than another. Further, Pinto has a convincing argument against Govier's attempt to assign a rough cardinal measure to a consideration on the basis of the kinds of factors that constitute exceptions to a *ceteris paribus* generalization and the frequency with which those kinds of factors occur. Determining whether a kind of factor is an exception to a *ceteris paribus* generalization, he points out (Pinto 2011, p. 117), requires ability to compare the strength of arguments licensed by that generalization to other arguments. Pinto argues that the strength of a consideration is a function of the risk taken in relying on it and its weight, the weight in turn being a function of the importance of the feature on which the consideration turns and the degree to which that feature is present. He sketches as a basis for further investigation an approach to working out the relative importance of criteria for the application of predicates with a normative dimension (i.e. what this chapter has earlier referred to as evaluative and prescriptive predicates) and of criteria for the application of purely descriptive predicate with open texture (i.e. what this chapter has earlier referred to as classificatory and interpretive predicates). He then works out principles for estimating the comparative strength of a single pro consideration and a single contra consideration on the basis of judgments of the relative importance of the two features on which the two considerations turn (based on whether we prefer a situation with one feature to a situation with the other "just a bit", "a fair amount" or "to a great extent"), the relative weight of the two considerations (determined by whether, other things being equal, we prefer a situation with one feature present to the degree it is present in the one consideration to a situation with the other feature present to the degree it is present in the other consideration "just a bit", "a fair amount" or "to a great extent"), and the degree of risk incurred in relying on each consideration (high, medium, low or nil). He points the way towards developing principles for more complicated comparisons of a set of pro considerations to a set of con considerations. Pinto's account appears to provide a way towards cashing out the metaphor of the pros "outweighing" the cons. But it is very abstract and, as he himself admits, not fully developed. More needs to be done to develop it and apply it to some real examples.

Quantitative comparisons, whether cardinal or ordinal, may however be the last resort in evaluating appeals to considerations. Kauffeld (2011) has pointed out other ways of ranking considerations that were used in the debates on the ratification of the United States constitution in 1787 and 1788. The Anti-Federalists who opposed its ratification raised a number of objections, each of which they took to be overriding counter-considerations. The Federalist response that the merits of the constitution outweighed these defects proved unpersuasive, because it failed to take the Anti-Federalist objections into account. Three Federalists writing under the pseudonym Publius then *reframed the issues* under consideration. The issue was not whether a power given to the national government was dangerous, they maintained, but whether the power was necessary and, if necessary, whether adequate safeguards had been included to protect against its abuse. This recasting of the issue raised by each of the Anti-Federalists' counter-considerations enabled the two sides to meet on common ground. Kauffeld infers from this example that assigning weights to the various considerations and weighing them

> seems to be one of several ways in which we manage pro and contra conductive arguments in attempting to reach a well reasoned conclusion. More basic reasoning/argument strategies involve ranking considerations and taking opposing considerations into account. But weight seems to be only one of several ways in which considerations can be ranked. (Kauffeld 2011, p. 166)

A rather different approach to evaluating appeals to considerations is taken by Freeman (2011), who applies his version of the Toulmin model to developing a set of "critical questions" for such arguments. Allen (2011) tests Freeman's proposal with reference to conductive argument used by two justices of the Supreme Court of Canada in support of conflicting judgments as to whether the Canadian Criminal Code statute prohibiting hate speech is consistent with the Charter of Rights and Freedoms that is part of Canada's constitution. He notes that the methodology used by the two justices does not lead them to follow the procedure Freeman recommends, of framing generalizing warrants and considering whether proper backing is available for them. Rather, it involves attention to the particularities of the case under review and judgments of reasonableness and of the values invoked in the light of those particularities. Allen concedes that, although the methodology used by the Supreme Court in such cases does not conform to Freeman's proposed method of appraising conductive arguments, an external evaluator might take Freeman's position. It may be, however, that the force of attention to the peculiarities of a case is to make the implicit warrant more specific. In that case, the judges' methodology may be consistent with Freeman's approach.

Beyond the appraisal of appeals to considerations in a static argument lies the whole process of developing and reworking the argument. It is this process on which Wohlrapp (2008, 2011, 2014), Bailin and Battersby (2010) and Battersby and Bailin (2011) have many significant proposals. Considerations of space and time unfortunately do not permit discussion of their proposals in the present chapter.

16.8 Summary

I have argued that there is indeed a distinct form of reasoning of the sort Wellman and Govier describe, but that both the label 'conduction' and the common metaphor of weighing up the pros and cons are misleading. The form of reasoning is better described as an appeal to considerations (or to criteria). The considerations cited are features of a subject of interest, and the conclusion drawn from them is the attribution of some supervenient status to that subject, such as a classification, an evaluation, a prescription or an interpretation. The conclusion of such reasoning may follow either "conclusively" from its premisses or non-conclusively or not at all. Weighing the pros and cons, however construed, is only one way of judging whether the conclusion follows, and perhaps only a last resort in making such judgments. Further, the move from information about the subject's cited features to the attribution of a supervenient status is often but one moment in a more complex process, a move that is typically preceded by other reasoning moves and may be followed by still others. In a thorough discussion of the supervenient status of such a subject, the relevant considerations and counter-considerations would ideally be integrated in such a way as to take the sting out of the counter-considerations.

16.9 Appendix: Examples of Conductive Reasoning

Govier cites the following five passages as examples of conductive argument:

1. There can be no doubt that Emily Bronte casts a vague incestuous aura over the entire plot of *Wuthering Heights*. Heathcliff marries his lost love's sister-in-law; his wife's son marries her brother's daughter; Cathy's daughter marries her brother's son. An unconsciously incestuous love between the two leading characters would not run counter to the tone of a novel filled with violent and savage scenes, such as the sadistic rubbing of a wrist over a broken window-pane, Cathy's fierce delirium, or the sight of Heathcliff smashing his bloody head against a tree. (Eric Solomon, 'The incest theme in *Wuthering Heights*', *Nineteenth Century Fiction* 14 (1951), pp. 82–83; cited by Govier in (1987a, p. 71) and (1999, p. 165))
2. That 'this exists' has any meaning in such cases, where, as Mr. Russell would say, we are using 'this' as a 'proper name' for something with which we are acquainted, is, I know, disputed; my view that it has involves, I am bound to admit, the curious consequence that 'this exists' when used in this way is always true, and 'this does not exist' always false; and I have little to say in its favor except that it seems to me so plainly true that, in the case of every sense-datum I have, it is logically possible that the sense-datum in question should not have existed – that there should simply have been no such thing. (G. E. Moore, 'Is existence a predicate?', in his *Philosophical Papers* (London: George Allen and Unwin, 1959), p. 126; cited by Govier in (1987a, p. 72)
3. Or we might talk about the "deeper truth" in myths, the more profound lessons Santa can teach. But this is a cheat, for two reasons. It fudges the fact that, on the mundane issue of where presents come from, parents know that what they're saying is false. (Real myth-makers believe their myths.) And it finds a deeper truth where there doesn't seem to be one. In the Santa story, presents come from a stranger who gives gifts to everyone.

In reality, presents come from parents who love their kids as individuals and give gifts to express this love. Isn't the reality more worth knowing than the myth? (Thomas Hurka, cited by Govier as from "a newspaper column" (1997, pp. 447–449, 1999, p. 160))

4. Usually the Santa lie, befitting Christmas, is a white lie.
   For starters, the lie is only temporary. You tell kids about Santa now, but you'll straighten them out later. The deception isn't forever. And the deception is a mild one. You don't take a falsehood and call it truth; you take a fiction and call it truth—a smaller distortion. This means the loss of the illusion is gentler. When kids are older they don't lose Santa entirely, they just think of him in a different way. Finally, the deception is good for kids. Believing in Santa adds magic and excitement to Christmas; the anticipation is keener, the delight sharper. Parental love is fine and even profound, but a gift more the North Pole is far from exotic. (Thomas Hurka, cited by Govier as from "a newspaper column" (1997, pp. 447–449, 1999, p. 161))
5. (W)hile I like to think of my lifestyle as environmentally conscious, it's actually not all that pure. To get to our house in the country, where the air is cleaner than it is in New York City, my husband and I rack up 350 miles every week. In the summer we pick fresh vegetables and fruit from our own garden, but in the winter we buy them from health food stores that truck them east from organic farms in California. And as a writer, I use paper—a great deal of paper—and that requires the felling of trees, even when I consciously write on both sides. Unavoidably, I use energy, and using energy makes waste. (Trebbe Johnson, 'Learning to love the waste', cited by Govier without further attribution in (1997, p. 446) and (1999, pp. 161–162))

The following examples were obtained through a Google search using the exact phrase "taking all these factors into account". Among the first 10 search results, some did not use this phrase to introduce a conclusion drawn from premisses. Others involved calculation, for example in drawing a conclusion about the size of an increase in the cost of living. Others involved predicting an effect on the basis of causally relevant factors. I quote the remaining three examples of apparently conductive reasoning.

6. The New Jersey Academy of Orthotists and Prosthetists has cancelled its annual conference, scheduled from Nov. 7-9 [2012–DH] in Atlantic City, NJ. Hurricane Sandy hit the Jersey shore and disrupted all essential services in the tri-state area, including NJ, NY and Conn. The New Jersey Academy of Orthotists and Prosthetists (NJAAOP) board and committee discussed the feasibility of going ahead with our conference. The major factors we considered were first, the safety of our members, and second, the lack of information from the hotel regarding the conditions at the hotel and in Atlantic City. The final factor was that most of our attendees have been out of work for assembly and it would be a hardship for them to attempt to attend the conference and miss 3 more days of work. Many members had flooding of their homes and many would not have access to gasoline for the trip. Taking all these factors into account we decided to cancel. We struggled with the decision but in the end we felt it was the right thing to do. (Carey Glass, President, NJAAOP, "NJAAOP meeting cancelled due to hurricane", November 6, 2012; http://www.healio.com/orthotics-prosthetics/education/news/online/%7Bba3c371d-1bf6-448b-82fc-b20e78c36571%7D/njaaop-meeting-cancelled-due-to-hurricane; accessed 2016 08 12)
7. What to Look for in Voice Recognition Software
   We based our review on a few simple criteria, all of which are important in a useful voice recognition program.

Features
This specialized software has to have the right kind of features. For instance, there needs to be a voice training of some kind to help the computer become familiar with your voice. Other features like customizable commands and accent support also expand the usefulness of the program.
Commands
The primary function of this software is to let you navigate your computer by voice. That means you must be able to open and close other programs and use the features within them all by voice command.
Dictation
The second most important function is dictation. This allows you to speak text into Word or other text editor. But the program must be good at recognizing speech in order to accurately transcribe it to text, so dictation is the true test of a good voice recognition program.
Accuracy
We tested the programs in dictation mode and assigned a score to each one based on how many errors they made in transcribing speech. A higher score means a program is better at handling all kinds of words. You can see the full results of our test in the Dictation Test article.
Ease of Use
Even if a program is excellent at interpreting your voice, it's practically useless if the commands and menus are difficult to use.
By taking all these factors into account, you can accurately choose software that suits you. Depending on your needs, you may find some features are more important than others. For instance, some people might be more interested in commands than dictation capabilities, so be sure to consult the scores for each review category. ("2013 compare best voice recognition software", *Top Ten Reviews*, http://voice-recognition-software-review.toptenreviews.com/; accessed 2012 12 04, not found 2016 08 12)

8. Aiming at the measurement, comparison and ranking of all kinds of public dangers, ranging from natural hazards to industrial risks and political perils, the preparation of national risk registers stands out as a novel and increasingly popular Western security practice. This article focuses on these registers and the analytical power politics in which they are complicit. We argue, first, that positing science as an objective determinant of security truth, national risk registers advance a modernist understanding of how knowledge of national dangers can be arrived at, discounting both sovereign and popular authorities; second, that by operationalizing a traditional risk-assessment formula, risk registers make possible seemingly apolitical decisions in security matters, taken on the basis of cost–benefit thinking; and, third, that risk registers' focus on risk 'themes' tiptoes around the definition of referent objects, avoiding overt decisions about the beneficiaries of particular security decisions. Taking all these factors into account, we find that risk registers 'depoliticize' national security debates while transforming national insecurity into something permanent and inevitable. (abstract of: Jonas Hagmann and Myriam Dunn Cavelty, "National risk registers: Security scientism and the propagation of permanent insecurity", *Security Dialogue* (February 2012), 43/1: 79–96; doi:10.1177/0967010611430436)

A Google search using the phrase "so on balance" turned up no substantive pieces of reasoning; in many cases, nothing preceded the phrase. The phrase "therefore on balance" produced the following four examples of apparent conductive reasoning among the first 10 results:

9. Really difficult to review accurately but, on balance, we loved it and would return.
   The hotel has a glorious setting right on the beach which is well groomed and clean. Security is excellent both on the beach and in the hotel 'grounds'. The dive centre combined with the ecological centre are also excellent and have plenty of 'kit' for hire including life jackets. If you like snorkelling, it's easy to get into the water from the beach, the bay is quite shallow & there is plenty to see including turtles, rays and a host of coral reef fish with some stunning colours. We didn't have children with us but if we had, it would be perfect for them.
   The restaurant was excellent. We did not have a bad meal. If we had known beforehand that the quality was as good as it was, we would have purchased a meal deal in advance saving 10% on bills.
   The rooms are kept very clean and the WiFi was a godsend.
   After all that, why didn't I give it an 'excellent' rating?
   Despite the fact that we would definitely return, the rooms in the hotel block are a bit 'tired' and need refurbishment. The wall & floor tiles need replacing, the kitchenettes need ripping out and updating, the aircon units need remote controls, the rooms need more power points available for recharging phones & iPads etc., and the light fittings [*sic*] need fittings. The WiFi signal is not strong enough since it 'drops out' when it shouldn't, the pool is functional but its poolside furniture is tired and needs replacing.
   All of the above might be 'picky' but my biggest gripe is that the bay is invaded by snorkel tours with seemingly no regulation. Those arriving by road seem fine but those disgorged into the bay by boats that moor up to await repatriation create a 'too busy' environment. My worry is that if the numbers of visitors are not controlled in some way, the turtles that everyone comes to see will be hounded out of 'their bay'.
   Before 09:30 in the morning, the bay is delightful. After 17:00 it is equally delightful. The hotel has it's [*sic*] own part of the beach that is shaded with palm trees and where loungers are available. You just have to ask. The 'offcomers' are kept at a distance and that allows a really relaxing session on the beach with plenty of space.
   Therefore, on balance, we loved it and would return. (review on tripadvisor.ca of Hotel Akumai Caribe, 24 November 2012, http://www.tripadvisor.ca/ShowUserReviews-g499445-d252781-r146088666-Hotel_Akumal_Caribe-Akumal_Yucatan_Peninsula.html; accessed 2016 08 12)
10. BUSINESSEUROPE would like to express its strong concern regarding the Commission's proposal for "backloading" in the EU Emission Trading Scheme (ETS). European business supports the central role played by the ETS in the EU climate policy and has called on EU policy-makers to start an open debate, involving all stakeholders, on the level of ambition for the EU ETS post 2020. This needs to take place within the context of a comprehensive debate about the future of the EU's energy, climate and industrial policies. An improved coherence among these policies will be crucial for the competitiveness of European industry.
    Prior to this longer-term view being developed, short-term measures such as changes to the ETS auctioning regulation to "backload" allowances must be avoided as these would interfere with a more constructive discussion on how to achieve a systemic solution. Pre-emptive short-term measures would create a precedent, resulting in greater uncertainty, and could have major repercussions for European business, which is already under strain from the economic crisis.
    Therefore, on balance, European business cannot support the proposal for a review of the auction time profile to implement a "backloading" in the EU ETS. (BUSINESSEUROPE, 3 October 2012, http://ec.europa.eu/clima/consultations/docs/0016/organisation/businesseurope_en.pdf; accessed 2016 08 12)

11. Two problematic spindle cell sarcomas involving upper jawbones in two adult male patients have been studied by histology, immunohistochemistry, and transmission electron microscopy, and respectively graded as low-grade malignancy and high-grade malignancy. While any single methodological study did not allow confident classification of them into one or other of the classical categories of spindle cell sarcomas (fibrosarcoma versus leiomyosarcoma), the overall contribution from all three methodologies ultimately allowed them to be categorized as sarcomas with myofibroblastic differentiation. Histologically, both tumors had morphological features of an amalgama [*sic*] between neoplastic fibroblasts and smooth muscle cells. Immunohistochemically, both tumors expressed reactivity only for muscle specific actin and alpha smooth muscle actin, in addition to vimentin. Ultrastructurally, both tumors, while showing fibroblast-like cytoplasmic features, had a spurious and imperfectly organized cell surface defying convincing classification into any of specific categories (i.e., both appeared in terms of ultrastructure as poorly differentiated sarcoma [*sic*], the former with low level of smooth muscle differentiation and possibly the presence of some fibronexus component, the latter with no smooth muscle differentiation but with possible evidence of very rare fibronectin fibril). Therefore, on balance, the most tenable diagnosis seemed to us that of a myofibrosarcoma in both cases. This work is presented considering the fact that myofibrosarcoma currently represents a topical theme of debate, and that this is the first report in medical literature concerning with [*sic*] myofibrosarcomas of the head and neck area in adults. (abstract of: Bisceglia M, Tricarico N, Minenna P, Magro G, Pasquinelli G. Myofibrosarcoma of the upper jawbones: a clinicopathologic and ultrastructural study of two cases. *Ultrastruct Pathol* (2001 Sep-Oct) 25(5):385–97. http://www.ncbi.nlm.nih.gov/pubmed/11758720; accessed 2016 08 12)
12. We have consulted with our members in regards to the different options for international criminal health checks and would therefore like to make the following comments with respect to each of the options.
    Option 1: *Applicant declaration only*
    The APA [Australian Physiotherapy Association–DH] recognises that this is the least labour intensive option for both AHPRA [Australian Health Practitioner Regulation Agency–DH] and the registrants. However we recognise that the downside to this streamlined approach means that it is unlikely false declarations would be found.
    This is not a major concern to the APA as physiotherapy is a low risk profession as evidenced by the data produced by AHPRA in 2010/2011. Only one applicant had a condition or undertaking imposed on their registration as a result of the checks and no physiotherapy registrants had applications refused. Therefore, on balance this is not an unreasonable option for the registration of physiotherapists. (Australian Physiotherapy Association, Consultation paper on criminal history checks, addressed to the Australian Health Practitioner Regulation Agency, 17 December 2012, https://www.physiotherapy.asn.au/DocumentsFolder/APAWCM/Advocacy/Submissions2012_APAresponsetoAHPRAregarding_internationalcriminalhistorychecks.pdf; accessed 2016 08 12)

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Chapter 17
"All Things Considered"

Abstract Diverse considerations may be relevant to deciding what to do, and people may disagree about their importance or even their relevance. Reasonable ways of taking such diversity into account include comprehensive listing of considerations, assessment of the acceptability and relevance of each consideration, reframing, adjusting the option space, debiasing, estimations of importance, and allocating the burden of proof.

17.1 Introduction

Practical reasoning in the most general sense is reasoning about what policy to adopt. A policy decision is a decision to do or permit or require or forbid a certain kind of action or complex of actions in a certain kind of situation. For example, it is my policy to arrive a couple of days early for conferences in Europe, in order to get over the jet lag. A plan can be regarded as a policy limited to one occasion. It can be syntactically complex, with nested Boolean operators, and can be more or less completely specified. For example, two conference attendees might plan to have dinner together at an Indian restaurant on a particular evening if they can find one with a good reputation but otherwise to join any group of conference goers who are going to a restaurant together. An action is a limiting case of a plan, an immediately implemented plan with just one component, such as presenting a paper at a conference. In what follows, I use the phrase 'deciding what to do' in a broad sense that includes adopting policies and plans as well as forming an intention to perform a particular action.

In deciding what to do, in any of these senses, diverse considerations are often relevant. These considerations may point in different directions. Further, if the decision is a group decision, members of the group may differ from one another on

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which considerations are relevant, as well as on the absolute or relative importance of a given consideration. In this paper, I suggest reasonable ways of taking such diversity into account.

17.2 Kinds of Consideration

Considerations may be of various kinds (McBurney et al. 2007).

A consideration may be a definite or probable or possible contribution to or frustration of a goal. For example, the declarer in a game of contract bridge has the goal of making the contract, and in most suit contracts preventing the opponents from trumping in contributes to that goal; thus in most suit contracts preventing the opponents from trumping in is a relevant consideration in deciding how to play the hand. In counter-insurgency warfare, it might be a goal to secure the loyalty of the general population that is not part of the insurgency, a goal that would be frustrated by indiscriminate attacks on populated areas held by the insurgents; hence avoiding civilian casualties in populated areas held by the insurgents is a relevant consideration in counter-insurgency warfare.

A consideration may also be a definite or probable or possible beneficial or adverse consequence. For example, a possible beneficial consequence of moving to a permissive legal framework on abortion is a reduction in crime rates starting 15–20 years after abortions become legal and available, because of the relatively high crime rate among men born to women who would have aborted their pregnancy if they had been able. A possible adverse consequence of legalizing assisted suicide or voluntary active euthanasia is social and moral pressure on aged and infirm people to make a "responsible" decision to ease the burden on themselves, their loved ones and society by deciding to end their life.

A consideration may be a prescription or prohibition, whether absolute or defeasible, by an authoritative norm. For example, the electricity safety rules of the University of St. Andrews in Scotland state: "There is an absolute duty to ensure that no electrical equipment is put into use where its strength and capability can be exceeded in such a way as may give rise to danger." (https://www.st-andrews.ac.uk/staff/policy/healthandsafety/publications/electricalsafety/; accessed 2016 08 12). The charter of the United Nations forbids its member states to initiate a war without authorization by the Security Council. This prohibition is defeasible, with the only permitted exception being self-defence against an armed attack (Article 51). An example of a defeasible prescription is the requirement in Quebec's Charter of Rights and Freedoms to come to the aid of anyone whose life is in peril. The law specifies the defeaters of this obligation: "unless it involves danger to himself or a third person, or he has another valid reason" (C-12, I.I.2, online at http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&file=/C_12/C12_A.htm; accessed 2016 08 12). Prescriptions and prohibitions can be treated as constraints on decision-making, but it is not irrational to override them for reasons other than those officially recognized. Almost all of us break the law on

occasion, for reasons that the law does not recognize as legitimate; for example, we exceed the speed limit when driving our car or ride our bicycle on a pedestrian crosswalk. Moral constraints are even more elastic, given the lack of codification of morality and the lack of any formal adjudication of charges of immoral behaviour.

Finally, a consideration may be possession by a contemplated policy of an intrinsically desirable or undesirable feature. For example, vigorous physical exercise adopted as a means to being healthy and fit might feel good, because of the dopamine flooding into one's brain. Or a medication taken orally may have an unpleasant taste.

17.3 Policy Question and Options

Surveying relevant considerations of all these types makes sense only against a background of a policy question and a range of options. For example, in thinking about what to do about human-caused climate change, there are two over-arching policy questions. First, how should humanity minimize future disruption of the Earth's climate by human activity? Second, how should humanity prepare for the anticipated effects of present and foreseeable climate disruption? It is important in formulating such questions to do so in a way that does not foreclose options by building part of the answer into the question. If for example the question of how to minimize future disruption of the Earth's climate by human activity were formulated as the question how to get to a global carbon-neutral economy, that would foreclose consideration of geo-engineering options that are compatible with a carbon-positive economy or of the more ambitious goal of a carbon-negative economy. Whatever care is taken in the initial formulation of a policy question, decision-makers need to be prepared to revise that formulation in the light of evidence-gathering, reasoning and discussion. Further, if the decision is to be made by a group, there will need to be resolution of any disagreements about how the policy question is to be formulated.

The options under consideration should be mutually exclusive, or confusion will result. In considering policies for reducing emissions of carbon dioxide from burning fossil fuels, for example, it would be a mistake to take the options to be regulation or carbon pricing, since there are options that combine both, such as cap-and-trade systems. The options need not be exhaustive, either logically or practically, but they should include the possibilities that seem initially most attractive. If the options are to be surveyed mentally rather than through an externalized process, they should be limited to at most three or four, which is as much as a purely mental consideration can manage. Constraints can be used to limit the initial option space. But flexibility may be needed as deliberation proceeds, if for example each of the options under consideration has serious drawbacks or is not feasible. This flexibility may take various forms: changing constraints, adding options, removing options, making options more specific, recasting options according to a different principle of division. And, as with the formulation of the

policy question, in group decision-making there will need to be resolution of any disagreements about the option space.

17.4 Listing Considerations

If the decision is important enough for thorough reflection, it makes sense to list all the considerations that anybody in the decision-making group thinks relevant. This was part of the approach of Benjamin Franklin, whose letter to the chemist Joseph Priestley of 19 September, 1772 is the earliest extant document describing an approach to taking diverse considerations into account:

> When these difficult Cases occur, they are difficult chiefly because while we have them under Consideration all the Reasons pro and con are not present to the Mind at the same time; but sometimes one Set present themselves, and at other times another, the first being out of Sight. Hence the various Purposes or Inclinations that alternately prevail, and the Uncertainty that perplexes us.
>
> To get over this, my Way is, to divide half a Sheet of Paper by a Line into two Columns, writing over the one Pro, and over the other Con. Then during three or four Days Consideration I put down under the different Heads short Hints of the different Motives that at different Times occur to me for or against the Measure. (Franklin 1990/1772)

Franklin goes on to describe his method of estimating the respective "weights" of the listed considerations, a method which I will discuss later. For now, it should be noted that Franklin's method of listing the pros and cons is over-simplified in at least three respects.

First, it assumes a simple decision of whether or not to adopt a specific "measure". More typically, there are a number of positively specifiable options. For example, if a government wishes to reduce greenhouse gas emissions in its jurisdiction, it can do so by direct regulation alone, by merely taxing fuels that emit greenhouse gases, or by solely introducing a cap-and-trade system that gives or sells to emitters tradable permits to emit specified quantities. One cannot reasonably list the pros and cons of more than two options by drawing a line down the middle of a page and putting the pros on one side and the cons on another. In fact, once cannot reasonably do so even when there are just two options. In his treatment of decision-making in the textbook *Practical reasoning in natural language*, Stephen Thomas repeatedly warns the student against assuming that a reason against one option is automatically a reason for its rivals; as an example, he notes that being on a diet that bans desserts made with sugar is a reason against choosing lemon pie but not thereby a reason for choosing chocolate cake instead (Thomas 1997, p. 390). Similarly, a reason for one option is not automatically a reason against another; for example, a couple deciding whether to go out to see a movie or stay home and watch a documentary might count enjoyment as a reason for seeing the movie but note that watching the documentary would also be enjoyable. In general, then, for each identified option the pros and cons should be listed independently of the

listings for the other options; thought is required to see if a pro or con for one option is respectively a con or pro for another.

Second, Franklin envisages listing of reasons pro and con by only one individual. If a group is making a decision, each member of the group should have the power to propose any reason that seems to them to be relevant, pro or con, to any option. One of the strengths of group decision-making, in fact, is the ability of a group to marshal more considerations than would have occurred to any one member of the group.

Third, Franklin omits any reasoning that may be involved in establishing the reality of a proposed consideration. In deciding how much saturated fat to include in one's diet, a relevant consideration might be the contribution of eating saturated fats to the level of low-density lipoprotein (LDL, or "bad cholesterol") in one's blood, which is a contributor to heart attacks and strokes. It is not self-evident that eating more saturated fats raises the level of LDL in one's blood, and in fact a recent systematic review of studies of the relation between dietary fats and heart disease found a more complicated picture:

> All lines of evidence indicate that specific dietary fatty acids play important roles in the cause and the prevention of CHD [coronary heart disease–DH], but total fat as a per cent of energy is unimportant. Trans fatty acids from partially hydrogenated vegetable oils have clear adverse effects and should be eliminated. Modest reductions in CHD rates by further decreases in saturated fat are possible if saturated fat is replaced by a combination of poly- and mono-unsaturated fat, and the benefits of polyunsaturated fat appear strongest. However, little or no benefit is likely if saturated fat is replaced by carbohydrate, but this will in part depend on the form of carbohydrate. Because both N-6 and N-3 polyunsaturated fatty acids are essential and reduce risk of heart disease, the ratio of N-6 to N-3 is not useful and can be misleading. In practice, reducing red meat and dairy products in a food supply and increasing intakes of nuts, fish, soy products and nonhydrogenated vegetable oils will improve the mix of fatty acids and have a markedly beneficial effect on rates of CHD. (Willett 2012, p. 13)

A rather complicated line of reasoning is required to get from this authoritative review to a set of dietary recommendations in a country's food guide or to a personal policy on what to eat. In general, reasoning or appeal to authority will lie behind any proposed consideration, and should be made explicit in a thorough consideration of what to do. Argument mapping tools are a useful means of doing so.

17.5 Evaluating Considerations

Franklin's method omits not only the reasoning supporting the reality of a listed consideration but also critical assessment of each consideration, whether or not its reality is supported by argument. Something that seems to be a "motive" for or against a "measure" might be merely apparent or irrelevant. Hence there needs to be a twofold evaluation of each identified consideration prior to any attempt to take it into account.

In the first place, it must be asked whether the consideration really obtains, and if so to what extent or in what form. How much would we really enjoy the documentary, in comparison to the enjoyment we would get from going out to a movie? What reduction in the risk of heart disease can be expected from replacing butter in my diet with polyunsaturated fats, red meat with fish, and whole milk with skim milk? If the reality of a listed consideration is supported by a line of reasoning, the reasoning needs to be assessed for its adequacy, with respect to both its ultimate assumptions and its inferential links, and with attention to alternative positions and the supporting evidence for them. The results of such assessments might typically be framed in terms of a probability distribution among possible values of a variable of interest. Perhaps the documentary would most likely be only moderately enjoyable, with a remote chance of being highly enjoyable and a bigger chance of being so boring that we will stop watching it mid-way through.

In the second place, each proposed consideration should be assessed for its relevance. Does the factor in the situation as we have assessed it really count for the option, as we have assumed? Perhaps it actually counts against it, or is irrelevant. Similarly for factors that have been listed as counting against an option. Harald Wohlrapp recommends that for each pro one consider how an opponent of the option might reply, and similarly for each con how a proponent of the option might reply. This procedure is part of what he calls "completing the discussion", the other parts being the questioning of each argument and counter-argument and seeking out the frames in which the decision-makers see the issue and state of affairs (Wohlrapp 2014/2008, p. 261). Supplying a counter-argument may result in changing a pro to a con, or vice versa. Wohlrapp gives some striking examples of such shifts in relevance status, in his discussion of a list in a textbook example (Govier 1997, p. 393) of reasons for and against legalizing voluntary active euthanasia for people with a terminal illness. One reason listed as supporting such legalization is its sparing family members the agony of watching a loved one die a horrible and unworthy death. An opponent of legalization could reply that awareness of such suffering can deepen one's appreciation of the fragility of life, in a way that Bertrand Russell reports as his personal experience (Wohlrapp 2014/2008, p. 257). Sparing people the agony of watching others suffer might encourage a superficial depersonalized hedonism of the sort portrayed in Aldous Huxley's *Brave New World*. Another reason listed as supporting legalization of euthanasia is that responsible adults should be allowed to choose whether to live or die, a consideration whose postulated positive relevance depends on assigning a positive value to individual self-determination. An opponent could claim that legalizing active euthanasia would put social and moral pressure on people with a terminal illness to do the "responsible" thing and have their life ended in order to spare their family and friends the distress of seeing them fade away and society the cost of providing for their care. According to this response, the increase in self-determination for the few terminally ill people whose excruciating suffering can only be relieved if someone else kills them is more than balanced by the decrease in self-determination for terminally ill people whose situation is not so dire (Wohlrapp 2014/2008, p. 264). Thus the principle that people should be allowed to choose whether to live or die

might be a reason against legalizing voluntary active euthanasia rather than for doing so.

These assessments of each proposed consideration include identification of possible objections to the judgments of its factual correctness and of its relevance, of possible replies to those objections, and so on potentially ad infinitum, a process that Thomas in particular emphasizes. For example, a claim that replacing red meat with fish in one's diet will reduce a person's risk of heart disease might conflict with a finding that people who eat more red meat and less fish are no more likely to develop heart disease than people who eat less red meat and more fish. A defender of the claim might reply by explaining away the anomalous finding.

Such thoroughness makes sense for important decisions where the decision-makers have the time and other resources to go through the process, but not for minor decisions.

17.6 Reframing

It may become appropriate to reframe the issue under discussion, for example as a way of introducing commensurability into what was previously a stand-off of incommensurable perspectives. Fred Kauffeld finds such a reframing in the debates in 1787 and 1788 over the ratification of the United States constitution. Anti-federalists objected that each of the threats to liberty in the proposed constitution was an overriding consideration against it. Federalists responded that the constitution's merits outweighed its defects. Thus there was a standoff, with the anti-federalists regarding the federalists as ignoring the overriding negative considerations that they had pointed out. *The Federalist Papers*, a series of essays written by three of the leading federalists under the pseudonym Publius, strove to reframe the issues. With respect to any power granted to the national government by the proposed constitution, Publius argued, the question was not whether the power was dangerous but whether it was necessary and if so whether adequate safeguards had been provided to protect against its abuse. Publius's reframing of the issues implied an allocation of the burden of proof that made back-and-forth discussion possible. First it was necessary for a defender of the constitution to show that a given power was necessary. Then the proponent had to show that there were adequate safeguards against the abuse of that power. Having accomplished these two tasks to "his" satisfaction, Publius declared that it was now up to the anti-federalist opponents of the constitution to justify continuation of the debate by addressing with reason and evidence the considerations as configured in the Federalist Papers.

Generalizing from this case study, we can conclude that sometimes a disagreement about the relative ranking or absolute degree of importance of one or more considerationsConsiderations can reasonably be finessed by recasting the issues under discussion. The epistemic success of any such reframing depends on whether it incorporates in a satisfactory way each party's perspective on the

considerations in question. In the debates over the ratification of the United States constitution, for example, the reframing incorporated the federalists' focus on the merits of the proposed constitution in the arguments for having a national government and for the necessity that it have each of the powers deemed dangerous by the anti-federalists. It incorporated the anti-federalists' concern about personal liberty in the issue of whether for each dangerous power there were enough safeguards against its abuse.

Other sorts of reframing may be necessary. Harald Wohlrapp has drawn our attention in his recent book *The Concept of Argument* (Wohlrapp 2014/2008) to the ubiquity of frames in every person's encounter with the world and with other people. A frame as Wohlrapp understands it is a way of seeing an issue or situation. One sees B as A. For example, the anti-federalists saw a powerful national government as a potential threat to liberty. If two people frame a state of affairs differently, they will tend to talk past each other and to be incapable of appreciating the other person's perspective. This sort of mutual incomprehension is particularly common when neither party is aware that they are framing the state of affairs in a certain way. It needs to be dealt with by identifying the frames and attempting to transcend their differences.

Wohlrapp takes integration of divergent frames to be the second (and final) objective in a discussion of identified pros and cons (Wohlrapp 2014/2008, p. 261). He describes four ways of overcoming frame differences. *Frame criticism* directly attacks a frame as inappropriate. It implies that the critic has gone beyond the frame and can see it as a whole, so to speak from outside it. An example might be a rejection of framing homosexual relations as perverse and unnatural. *Frame hierarchization* makes competing frames explicit as aspects and puts those aspects into a hierarchy. For example, one can see a car that one is about to buy as a status symbol or as a mode of transportation. These frames might compete, for instance if nervousness about damaging the status symbol makes one reluctant to drive the car. Then one can externalize these frames as aspects of the situation and put psychological comfort in driving the newly purchased car above its status. *Frame harmonization* finds a way to reconcile two competing frames. The reframing of the issues in the debate on ratifying the United States constitution harmonized the federalists' framing of the constitution as a way to provide the national government with powers that it needed with the anti-federalists' framing of it as opening the way to dangerous abuse of those powers. *Frame synthesis* preserves two competing frames in a "higher" frame that accommodates them both in a Hegelian sublation. Wohlrapp gives an example of a frame synthesis from a speech by Saint-Just in the French parliamentary debate of 1792 over what to do with the deposed King Louis XVI. Previous speakers had argued that from a moral point of view the king deserved to be punished for his behaviour before he was deposed (e.g. trying to flee the country, conspiracy with foreign powers to have them restore him as an absolute monarch) but that from a legal point of view there was no way to try him for what he did while he was still king and therefore above the law. Thus there was a stand-off between incompatible frames. Saint-Just argued that both frames assumed falsely that the king was a member of society. On the contrary, from the perspective

of those who are founding a Republic, the king is a usurper who could not have been part of an original social contract. Having attacked the Republic, he should be judged as an enemy alien and treated according to the practices of war.

17.7 Debiasing

Throughout the processes described to this point, it makes sense to try to remove any distorting effect of one's initial biases, meaning by a bias "a disposition, implicit or explicit, to reach a particular kind of conclusion or outcome, or to remain in one" (Kenyon and Beaulac 2014, p. 344). Removing distorting effects of one's biases is a difficult task, since a bias may take the form of a latent frame of which one is not even aware. Further, awareness may not be enough to prompt the appropriate correction. Bias in a decision-making situation may in this respect resemble confirmation bias, which has been shown to operate even when there is a very weak initial commitment to a hypothesis and to persist even after explicit recognition that one starts with an inclination to believe a certain explanation of some phenomenon (Nickerson 1998). Recognition of bias is just a first step. It is however a step that needs to be taken, and it does not automatically occur. With respect to general cognitive and affective biases that we inherit from our species' evolutionary history as part of our intuitive "system 1" thinking processes, recognition can come from learning about such things as the availability heuristic and the representativeness heuristic (Kahneman 2011). It can also come from diagnosis of the causal pathway that led one to make a serious cognitive or affective mistake (Croskerry et al. 2013). With respect to biases specific to the particular decision-making situation, recognition is a matter of noting one's initially preferred option and one's initially privileged considerations.

Once recognized, biases need to be taken into account appropriately. Croskerry et al. (2013) distinguish three types of strategies for overcoming bias: educational strategies designed to enhance future ability to debias, workplace strategies designed to be implemented at the time of dealing with a problem, and forcing functions designed to nudge a decision-maker towards a better outcome. They caution that these strategies are not mutually exclusive but lie on a spectrum, and that there is uneven evidence for their effectiveness. Some of the strategies they mention are specific to the context of medical diagnosis about which they are writing, but others are more generally applicable. Among the educational strategies, they cite evidence for limited effectiveness of a "consider-the-opposite" procedure and of teaching rules of statistical inference. Among the workplace strategies, they mention identifying more aspects of a problem, meta-cognitive reflection on the thought processes that have led one to a certain conclusion, group decision-making, being required to justify one's decision and be accountable for it, avoiding cognitive overload and fatigue, making an initial judgment on one's own before attending to what others have concluded, and using decision support systems. Two of their forcing functions that have general application are seeking evidence that

supports a decision opposite to one's initial impression and considering whether there was a control group in a study of a suspected causal relationship.

Kenyon and Beaulac (2014) cite experimental evidence that teaching and warning people about kinds of bias and situations where they arise is ineffective in mitigating biased reasoning. One can be aware of a certain kind of bias but fail to recognize that one is oneself exhibiting that bias. In fact, monitoring oneself for bias in the process of thinking about some problem has been found to make matters worse, in that people think falsely that they have eliminated any possible bias by paying attention to the possibility that it is operative. The strategy that has been found in experimental studies to be most effective, and most generally effective, is to consider explicitly a range of alternative perspectives or counterfactual outcomes, and what would have had to happen in order for those outcomes to occur. Kenyon and Beaulac produce a useful taxonomy of levels of debiasing, ranging from the most individual and least effective to the most contextual and most effective:

> *Level 1 debiasing* (prior elimination of bias): General education, environment, habituation and training lead an individual to have no disposition to produce a particular sort of biased judgment. The bias does not arise.
>
> *Level 2 debiasing* (self-generated correction of bias): In a judgment situation, an individual uses previously learned behavioural or cognitive strategies to revise an occurrent or incipient biased judgment.
>
> *Level 3 debiasing* (environment-generated correction of bias): In a judgment situation, situational nudges prevent bias that would otherwise have affected the judgment.
>
> *Level 4 debiasing* (environment-generated overriding of bias): Biased judgment occurs, but situational constraints prevent the action or outcome from being biased. (Kenyon and Beaulac 2014, pp. 350–352, paraphrased)

One example of level 4 debiasing is anonymous grading of students' work, which automatically removes any effect of the grader's preconceptions of the expected quality of work from the students that they have come to know personally —an effect that has been repeatedly demonstrated in educational research. Another example is having candidates for an orchestra position perform behind a screen, a procedure that has been shown to reduce dramatically a widespread bias against women in such hiring decisions. Level 4 debiasing strategies in decision-making contexts will be specific to the kind of context and kind of decision involved. They will have in common that a type of bias irrelevant to making the decision is identified in advance and the decision-making context is structured so that the bias can have no influence on the ultimate decision.

17.8 Weighing

At some stage in the decision-making process described so far, there will ideally emerge an agreed policy question with an agreed list of options, for each of which there is an agreed set of positively relevant considerations and an agreed set of

negatively relevant considerations–the agreements resulting in each case from comprehensive reasoned, dynamic discussion. There then arises the issue of how to take this diversity into account in a reasonable way, an issue that becomes even more pressing if there is residual disagreement about either the policy question or the option space or the considerations relevant to one or more options. Wohlrapp insists that a listing of pros and cons reflects an interim state of the discussion. If the members of the decision-making group complete the discussion and integrate the frames as he recommends, he claims, either a single option will emerge as a "valid" decision or the parties will become aware of the basis for their residual disagreement (Wohlrapp 2014/2008, p. 263). If the parties resort prematurely to some sort of "weighing" of the pros and cons, he maintains, then they have shifted from seeking an argumentatively valid decision to seeking a balancing of interests (Wohlrapp 2014/2008, p. 261). Whether or not his claim is correct, it seems utopian to expect individual or group decision-making to reach a stage in all cases where there are no longer competing pros and cons for each of two or more options. If such competing pros and cons remain, something analogous to weighing seems inevitable.

Franklin describes his method of weighing pros and cons as follows:

> When I have thus got them all together in one View, I endeavour to estimate their respective Weights; and where I find two, one on each side, that seem equal, I strike them both out: If I find a Reason pro equal to some two Reasons con, I strike out the three. If I judge some two Reasons con equal to some three Reasons pro, I strike out the five; and thus proceeding I find at length where the Ballance lies; and if after a Day or two of farther Consideration nothing new that is of Importance occurs on either side, I come to a Determination accordingly.
>
> And tho' the Weight of Reasons cannot be taken with the Precision of Algebraic Quantities, yet when each is thus considered separately and comparatively, and the whole lies before me, I think I can judge better, and am less likely to take a rash Step; and in fact I have found great Advantage from this kind of Equation, in what may be called Moral or Prudential Algebra. (Franklin 1990/1772)

Franklin's "moral or prudential algebra" leaves it quite unclear how one is to assign weights to the reasons pro and con some option. Trudy Govier has proposed a method for doing so in the fourth (Govier 1997) and subsequent editions of her textbook. The weight or strength of a consideration, she claims, is inversely proportional to the number of exceptions to the principle in virtue of which the consideration counts for or against an option. Thus she takes it to be a weak consideration that legalizing voluntary active euthanasia for terminally ill patients would cut social costs, since there are many exceptions to the principle that a practice that cuts social costs should be legalized. It is a stronger consideration that legalizing voluntary active euthanasia would save many patients from great pain, she claims, since there are comparatively few exceptions to the principle that any practice that would save people from great pain should be legalized. Wohlrapp has objected (Wohlrapp 2014/2008, pp. 256–258) that it is possible to give only an intuitive estimate rather than an exact count of the number of exceptions to a general principle and that it would show a lack of understanding to calculate

arithmetically the scores of the pros and the scores of the cons on the basis of a principle's estimated number of exceptions. Others expressed similar scepticism at a 2010 symposium on so-called "conductive arguments" (Blair and Johnson 2011); in her subsequent "overview of the symposium" (Govier 2011), however, Govier did not respond to their doubts.

Even if one could somehow develop a way of measuring or estimating the weight of a consideration, it would seem ludicrous to baptize (say, as a "graviton") a unit of weight for considerations, to assign so many such units with a plus or minus sign to each consideration, to calculate the total weight of the pros and cons for each option, and to choose the option with the highest resulting score. If in the lead-up to such a numerical calculation, members of a decision-making group disagree about the weight to be assigned some consideration, discussion will ensue about the reasons for giving it more or less weight than some other competing consideration. This discussion is the real core of the balancing of competing considerations; assignment of weights on some invented cardinal scale is a confusing epiphenomenon.

Fred Kauffeld has usefully classified and listed (Kauffeld 2011, p. 160) the descriptive adjectives that people use to indicate the importance, relative or absolute, of a consideration. In relation to other considerations, a consideration can be on the one hand decisive, overriding or paramount, or on the other hand trivial or insignificant. With respect to the response it merits, a consideration can be noteworthy, weighty, sobering, tiresome, serious, compelling, powerful, persuasive, disturbing, reassuring or interesting. Such descriptors can provide guidance in the final stages of taking the relevant considerations into account. They are of course subject to challenge, and responses to such challenges are possible. Such challenges and responses can be supported by appeal to underlying values, which may themselves become subject to discussion.

In group decision-making that takes into account a variety of considerations, it can be helpful to agree on where the burden of proof lies (Bailin and Battersby 2010). There is a presumption in favour of existing policy, whether of a family or a voluntary organization or a state. The force of the presumption is to put a burden on an advocate of change to show that the change would on balance have better results. The presumption is weaker or even non-existent if the existing policy has obvious major disadvantages or has been adopted with a weak or absent evidential basis. It is stronger if the existing policy has been adopted as a result of careful deliberation and the relevant circumstances have not changed significantly.

17.9 Soundness and Completeness

It seems difficult to conceptualize the processes described above in a way that makes possible the sort of proofs of soundness and completeness that we find in the meta-theory of various logical systems, in particular because the processes are in part dynamic and creative. However, a decision-making process that fails to take

into account a major relevant consideration can reasonably be called incomplete, and one that results in a decision that flies in the face of the preponderance of relevant considerations can reasonably be called unsound. It is worth exploring how far we can get in making more precise and comprehensive such informal criteria for soundness and completeness.

17.10 Prospects for Quantification

It seems unlikely that the complexities involved in taking diverse considerations into account can be treated by a Bayesian or similar quantitative approach. Proponents of such a quantitative approach (Hahn and Hornikx 2016; Selinger 2014) could try to apply it to a complex case of practical decision-making about which the relevant facts are known, in the way that the Bayesian approach was applied in a book-length study to the Sacco-Venzetti trial (Kadane and Schum 1996).

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Chapter 18
Postscript

Abstract Argumentation schemes should be generated by a mixture of top-down theorizing and bottom-up abstraction, should be both descriptive and prescriptive, can all be regimented into species of a single one-premiss super-scheme, should be as general as is consistent with being readily applicable, have three kinds of associated critical questions (concerning their premiss, their assumptions, and exceptions), are the same as reasoning schemes, and in general straddle the distinction between conclusive and non-conclusive support. Appeals to considerations or criteria, sometimes called 'conductive reasoning' or 'conductive arguments', are better treated in a dynamic way that takes account of the subjectivity of their authors and critics, rather than with the static approach of argumentation schemes and critical questions. One can reasonably take into account diverse considerations and disagreements about them by comprehensively listing considerations, assessing their acceptability and relevance, reframing, adjusting the option space, debiasing, estimating importance, and allocating the burden of proof. Reasoning by analogy projects a queried property from one or more source cases to a target case on the basis of one or more assumed similarities. It can be validated either by a determination relation or by recognition that the source cases have the queried property in virtue of having the assumed similarities or (weakly) by the number and variety of shared similarities and small number of dissimilarities. Practical reasoning, i.e. reasoning about what is to be done, takes many forms: not just means-end reasoning, but also application of a general principle to a particular case, adoption of a policy on the basis of relevant considerations, appeal to consequences, and so on. John Pollock's model of practical reasoning is superior to others in taking into account likings and dislikings as well as beliefs, desires and intentions. But it is deficient in making no allowance for communication between rational agents, social cooperation, or moral constraints. Formal systems for deliberation dialogue (i.e. dialogue about what is to be done) should allow for a variety of types of non-factual input, not just goals but also preferences, values and constraints. Likewise decision-support systems should allow for a variety of argumentation schemes and should be transparent to their users about the argumentation used to produce a recommendation. Means-end reasoning involves not only selecting a goal and discovering a means that would achieve it but also ascertaining that the goal is

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achievable, that the means is permissible, that no alternative means is preferable, and that the side effects do not outweigh the benefits of achieving the goal.

The essays collected in Part III, "Patterns of reasoning", work out, on the basis of the generic conception of conclusive consequence developed in the essays on material consequence in the immediately preceding part, more specific conceptions of non-conclusive support that in some contexts can be adequate for one's purposes. Generic conclusive consequence is constituted by a counterfactual-supporting covering generalization that holds for all its instances. Non-conclusive but possibly adequate support is constituted by such a generalization that holds either for most of its instances or for all instances *ceteris paribus* (i.e. wherever there is no undermining or overriding exception-making circumstance). Working out this approach for apparently legitimate but usually non-conclusive patterns of reasoning (such as reasoning by analogy, inductive generalization and extrapolation, and means-end reasoning) both substantiates criteria for good reasoning of these sorts and tests the generic conception of consequence.

18.1 Argumentation Schemes

The essays on patterns of reasoning can also be seen as a contribution to a program of research on so-called "argument schemes" or "argumentation schemes" that has been taken up in the field of artificial intelligence (Walton et al. 2008; Rahwan and Reed 2009; Wyner 2016). The program has its origin in treatments in introductory textbooks in logic and argumentation, in the fields of speech communication and philosophy, of such typically non-formal and non-conclusive patterns of reasoning as inductive generalization, inference to the best explanation, and reasoning by analogy. Such textbooks typically set out a scheme or pattern of reasoning that has at least one variable, such as the following pattern for inductive generalization:

> All observed instances of kind K have property F.
>
> Therefore, all instances of kind K have property F.

The textbooks typically point out that not all arguments of this pattern with true premisses have a true conclusion. For example, there was a time when all observed swans were white, but it turns out that in Australia there are black swans. The question that needs to be asked about such arguments is whether the observed instances are representative of the kind with respect to the variable of which property F is a value (in the example, the variable of plumage colour). A textbook may give advice on how one determines representativeness, e.g. by considering the method of selecting the instances or by looking for theoretical reasons for expecting (or not expecting) uniformity in the relevant respect within the kind. And it may give criteria for identifying, and responding to, common mistakes in the use of this

kind of reasoning. It may for example urge readers to be alert for, and avoid in their own thinking, inferring a universal generalization from a *biased sample*, where the observed instances are selected in such a way that they are likely to be unrepresentative of the kind in the relevant respect. Similarly, it may warn against *hasty generalization*, where not enough instances have been observed to make the truth of the universal generalization probable.

The research program on argumentation schemes aims to identify such commonly occurring patterns of reasoning and to articulate the "critical questions" that an evaluator should ask in order to determine whether an argument of a given pattern provides adequate support for its conclusion. These questions divide naturally into three types (Gordon et al. 2007). The first type concerns the acceptability of the premisses, i.e. whether they deserve to be accepted according to the evaluator's criteria (such as being true, known, justified, or generally accepted). For example, do the observed instances really all have the property F? The second type concerns unstated assumptions that the pattern of reasoning requires to be true, where in a dialectical context the burden of "proof" (i.e. of giving supporting reasons for the assumption) reasonably rests on the proponent of the conclusion. For example, are the observed instances representative of the kind in the relevant respect? The third type of critical question concerns possible exception-making circumstances that undermine the inference or show that the conclusion is false despite the truth of the premiss(es) and support for the proponent's assumption(s). In a dialectical context, the burden of proof with respect to such questions rests with a rational critic of the argument rather than with the proponent of its conclusion. For example, is there a previously unobserved instance that lacks property F?[1] In more recent work, Wyner (2016) has developed an abstract generic characterization of argumentation schemes that integrates them with abstract argumentation as described in seminal papers by Dung (1995) and Prakken (2010).

We can find an early anticipation of this approach in Aristotle's advice in *Topics* VIII VIII (Aristotelis 1984, Aristotle 1984) to participants in question-and-answer discussions aimed at subjecting a proponent's thesis to critical examination. One form of argument that the questioning opponent may use is inductive generalization. The opponent asks the proponent to grant the truth of a number of instances of a target universal generalization. Once these are granted, the opponent draws the universal generalization as a conclusion. If the proponent has granted many instances but refuses to grant the universal, it is fair for the opponent to demand an objection, i.e. a counterexample (*dikaion apaitein enstasin*, 157a35). A proponent who does not grant the universal in the face of many supporting instances, despite having no objection, is plainly peevish (*phaneron hoti duskolainei*, 160b4-5). Aristotle's dialectical treatment of this form of reasoning is obviously

[1]Verheij (2003) proposes to analyze argumentation schemes formally as consisting of a conclusion, premisses, exceptions and conditions of use. He takes the critical questions to correspond to the exceptions. However, one can ask about an argument fitting a given scheme whether the premisses are justified and whether the conditions of use are met. These correspond to critical questions about the premisses and critical questions about the assumptions.

underdeveloped, since it does not allow the proponent to ask his opponent to justify the assumption that the instances chosen are representative of the kind. But it is an early anticipation of the dialectical approach that permits shifting the burden of proof once some supporting evidence for a conclusion is in place.

The research program on argumentation schemes gives rise to a number of questions, usefully posed by Blair (2001, pp. 368–371) in his response to Douglas Walton's *Argument Schemes for Presumptive Reasoning* (Walton 1996). I addressed one of these questions, "Where do argumentation schemes come from?", in the article "The generation of argument schemes" reprinted in the present part. There I identified in the scholarly literature three types of approaches to generating schemes: bottom-up, top-down, and mixed. Bottom-up approaches, typified by that of Chaim Perelman and Lucie Olbrechts-Tyteca in their classic work *La nouvelle rhétorique* (1958, 1969), abstract patterns from a corpus of actual arguments; such approaches lack theoretical control over the way arguments are grouped for the purpose of extracting patterns and over the criteria for adequate inferential support in arguments of each pattern. Top-down approaches like that of Wayne Grennan in his *Informal logic: Issues and approaches* (1997) take a combinatorial approach to generating a comprehensive list of theoretically possible patterns of argument; they run the risk of a combinatorial explosion that generates patterns that are rarely if ever found in practice. Mixed approaches like that of Arthur Hastings in his doctoral dissertation on modes of reasoning in argument (Hastings 1962) combine applicability to actual arguments with theoretical control over how they are grouped, at what level of abstraction they are articulated, and what are the critical questions to be asked of an argument of a given scheme. I continue to think that mixed approaches to generating argument schemes are superior to purely bottom-up or purely top-down approaches. Any system of argumentation schemes needs to combine theoretical control with empirical applicability.

This postscript may be an appropriate place for me to record my present thinking on six[2] of Blair's other seven questions:

1. Are the schemes meant to be descriptive or prescriptive? In either case, what gives them normative force?
2. On what principles are schemes to be classified? How are schemes to be distinguished by type?
3. How general should an argument scheme be? How is the question of the correct level of generality to be properly decided?
4. Which are the right kind, and number, of critical questions to ask with respect to any given scheme? How is that to be decided?
5. Are there both argument schemes and reasoning schemes, or only one, and if so, which one? Or is there no distinction between arguments and reasoning, or at least between argument schemes and reasoning schemes?

[2]The seventh question is specific to Walton's account: "Are all the details of Walton's account of argumentation schemes for presumptive reasoning correct?".

6. How are presumptive argumentation schemes related to those for inductive or deductive reasoning? What is the correct general theory of argument schemes? (Blair 2001, pp. 368–371).

1. *Status of schemes*: Schemes should be both descriptive and prescriptive. They should describe a form of reasoning and argument that on the one hand is common enough to be worth singling out for attention as a means of analysis and critique or as an aid to constructing arguments, but on the other hand sometimes has probative force. What gives a scheme normative force is the truth,[3] for a determinable subset of its actual and hypothetical instances, of a covering generalization. For example, the scheme mentioned earlier for inductive generalization has normative force because all instances of a kind, even hypothetical ones, have any property possessed by all its observed instances whenever these instances are representative of the kind with respect to the variable of which the property is a value. Other writers take argument schemes to have normative force in virtue of having a covering generalization that holds in the absence of unusual but not completely specifiable exception-making circumstances (Grennan 1997, pp. 22–24), or of either being deductively valid or conforming to the probability calculus or conforming to a calculation of prospect desirability (Lumer 2011), or of raising the degree of rational belief in the conclusion according to Bayes' theorem (Hahn and Hornikx 2016).

2. *Classification of the schemes*: Kienpointner (1992), Grennan (1997), Walton et al. (2008) and Lumer (2011) have proposed taxonomies of argument schemes. Jean Wagemans and I (Hitchcock and Wagemans 2011) proposed to classify single-premiss schemes at the highest level into two types. *Predicate-transfer schemes* use a premiss attributing a property Z to some object x as the basis for attributing another property Y to x; for example, arguments from sign use a premiss that a sign Z belongs to an object x as the basis for attributing to x a property Y of which Z is a sign, as when one infers from the fact that someone (x) has a fever (Z) that they have an infection (Y). We noted that all predicate-transfer argumentation is sign argumentation, in the sense that it takes Z to be a sign or indication of Y. Such argumentation, we noted, assumes as an unexpressed premiss that generally any W that is Z is Y (and X is a W).[4] *Referent-transfer* schemes use a premiss attributing a property Y to some object z as the basis for attributing the same property Y to another object x; for example, inductive generalizations use a premiss that all observed instances (z) of a kind have some property Y as the basis for attributing Y to all (x) unobserved instances of the kind. We noted that all referent-transfer argumentation is similarity argumentation, since the transfer of a predicate from one object to another presupposes some similarity between them that justifies the transfer. Similarity argumentation assumes as an unexpressed premiss,

[3]Truth here should be understood in a broad sense that includes the validity of a normative or evaluative generalization.

[4]I would personally treat this "unexpressed premiss" as an inference-licensing covering generalization, and would require that it support counter-factual instances.

we noted, that generally whatever value of variable V belongs to *z* also belongs to *x* (and Y is a value of variable V). We then listed a number of coordinate predicate-transfer and referent-transfer schemes, without any attempt to sub-classify them, and noted that our list was incomplete, as we thought any such list would be. We did note that there might be species and sub-species of the second-level schemes that we distinguished. One scheme is a species of another if and only if its associated critical questions include all the critical questions associated with the other scheme, and more besides. Wagemans (2016) has subsequently developed what he calls a "periodic table" of argument schemes based on the initial division of the earlier article. Arguments fitting a predicate-transfer scheme he now calls predicate arguments and arguments fitting a subject-transfer scheme subject arguments. He then identifies three other dimensions on which arguments vary independently. First-order arguments have a simple subject in their conclusion, whereas second-order arguments like arguments from authority have a proposition as their subject. The premiss can be factual, evaluative or policy-recommending. And so can the standpoint. Thus there are 36 ($2 \times 2 \times 3 \times 3$) possible types of arguments. For example, the argument that unauthorized copying, because it does not deprive the owner of use, is not a form of theft is a first-order predicate argument with an evaluative conclusion and a factual premiss.

I now think that the division into predicate-transfer and subject-transfer schemes is superficial and unnecessary, since all single-premiss schemes can be regimented into a form with a shared referent and a transition from one predicate to another. For example, inductive generalization can be expressed as the scheme: Kind K has property F belonging to all its observed instances, so kind K has property F belonging to all its unobserved instances. Reasoning by analogy can be expressed as the scheme: Queried property Q belongs to analogue cases 1 through n that share similarities S with target case T, so queried property Q belongs to target case T. Further, I think that all elementary argument schemes that are not purely formal but have a determinable subset of probative instances can be expressed with a single premiss in subject-predicate form. Thus all such argument schemes are of the form: x has property F, so x has property G. This form of argument not only is formally invalid but also is of no probative weight without specification. Particular arguments of this form, or sub-types of such arguments, have a good inference if a true covering generalization (which may hold only generally rather than universally) supports counter-factual instances. We can easily distinguish some high-level types that can in turn be divided into species and sub-species. Source-based arguments, for example, use a premiss that some source asserted something as the basis for claiming that what was asserted is true: *p* was asserted by source S, so *p* is true. Two common sub-types of source-based arguments are appeal to eye-witness[5] testimony and appeal to expert opinion, for each of which intricate sets of criteria (i.e. of "critical questions") have been developed (Norris and King 1984; Walton

[5]I use the word 'eye-witness' to cover all testimony based on direct observation, by whatever sense.

1997). We should not expect, however, that any taxonomy will be complete in the sense that all actual or potential arguments exhibit at least one scheme in the taxonomy. Argument and reasoning are too varied for such neat pigeon-holing. Indeed, in using any taxonomy of schemes as a device for analyzing and evaluating arguments, one is at serious risk of distorting the discourse or text to fit into one's taxonomy. Sometimes there is no shoe that fits a particular foot.

3. *Level of generality*: Coordinate high-level schemes should be specific enough that they can readily be used to analyze or construct an argument, and as general as possible consistent with this constraint. Appeal to assertion by a source is a good example of such a usable but highly general high-level scheme. Such high-level schemes can usefully be subdivided in accordance with shared critical questions. For example, it makes sense to group all appeals to eye-witness testimony as belonging to a single scheme, since the same set of critical questions apply to all such appeals. The same is true of appeals to expert opinion. Whether it makes sense to subdivide appeals to expert opinion depends on whether sub-sets of such appeals uniquely share additional critical questions.

4. *Number and kind of critical questions*: As previously mentioned, critical questions can readily be grouped into questions about the stated premiss, questions about assumptions and questions about exceptions. There is only one question to be asked about each stated premiss: Does it meet the standard of premiss adequacy appropriate for the argument's context and purpose? This question is not peculiar to the argument scheme in question, and so might easily be omitted. But many lists of critical questions include such questions. If elementary (i.e. single-inference) argument schemes are stripped down to a single operative premiss and regimented into predicate-transfer form (*x* is Z, so *x* is Y), then the form of the high-level questions about assumptions is whether any W that is Z is generally Y and whether x is a W, and the form of the high-level question about exceptions is whether *x* has some characteristic U that undermines or rebuts the inference from its being Z to its being Y. These high-level questions can be divided, for example if the species W is constituted by a conjunction of characteristics or the undermining or rebutting characteristics U are specifically described. Any such division runs the risk of being incomplete.

5. *Argument schemes and reasoning schemes*: I personally see no difference between them. In calling something an argument scheme, one envisions its instantiation in an inference-containing discourse addressed to someone else. In calling something a reasoning scheme, one envisions its instantiation in an inferential process that may be addressed to someone else, but need not be. The formulation of a scheme and of its critical questions is independent of the choice between these two ways of envisaging its instantiation.

6. *The relation between presumptive, inductive and deductive schemes*: Aside from purely formal schemes like *modus ponendo ponens* and *modus tollendo tollens*, schemes do not carry on their face any particular type of inferential strength. Inductive generalization, for example, is sometimes a conclusive form of reasoning, namely, when there are well-established theoretical reasons for thinking that all instances of a kind are uniform in some respect, like the solubility of a certain

chemical compound in water of a specified temperature. Reasoning by analogy provides either conclusive or probabilistic or presumptive support, depending on whether the inference-licensing covering generalization is true universally or for the most part or in the absence of some exception-making circumstance.

18.2 Appeals to Relevant Considerations or Criteria

Three chapters in the present part discuss a form of reasoning that is described most perspicuously as an appeal to considerations or criteria. Such reasoning uses one or more features attributed to some object as a basis for a further characterization of that object—typically its classification or evaluation, or a recommendation concerning it. Examples are a psychiatric diagnosis resting on possession of a number of the symptoms by which a disorder is defined, a rating of a movie based on its cited merits and defects, or a recommendation to legalize voluntary euthanasia with specified safeguards on the basis of the superiority of such a policy ("all things considered") to any alternative policy. Typically, there is no way other than appeal to such criteria or considerations to come to a reasoned judgment about whether to accept the conclusion. A psychiatric disorder defined by symptoms cannot be detected except by observing symptoms; there is no gold standard for movie ratings; and policy recommendations on issues as emotionally fraught as the legalization of voluntary euthanasia cannot reasonably be deduced from exceptionless moral principles applied to uncontroversial factual claims.

Appeals to considerations or criteria are common. In a sample of 50 single-inference arguments selected by random methods from English-language books in the library of a research-intensive university (Hitchcock 2002), evaluation by criteria was the most common form of reasoning, used in 11 (22%) of the 50 arguments. Three other arguments also involved appeals to considerations or criteria: one classification by criteria, one pros-and-cons decision-making, one pros-and-cons evaluation. Thus, altogether 28% of the arguments found in scholarly books in English (14 of the 50) were appeals to considerations or criteria. In a randomly selected sample of 39 single-inference arguments by callers to radio and television phone-in programs (Hitchcock 2010), almost half (46%) of the arguments were appeals to considerations or criteria, with 13 (33.3%) classified as prescriptions by criteria and five (12.8%) as evaluations by criteria. These results suggest that roughly a third of all single-inference arguments are appeals to considerations or criteria.

Despite their ubiquity, such arguments have received very little theoretical attention. Typically, they are not conclusive; that is, they usually do not have a true exceptionless covering generalization that supports counter-factual instances. Hence, even if all the premisses of such an argument meet the conditions of premiss adequacy appropriate to the context and purpose of the argument, and even if each consideration or criterion is relevant to the conclusion, and even if the positively relevant premisses in some sense "outweigh" the negatively relevant premisses,

further information about the object referred to in the premisses and the conclusion may undermine or override the support of the premisses for the conclusion. Reconstruction of such arguments as formally valid would therefore in most cases need to attribute a place-holding unexpressed premiss to the effect that unmentioned features of the argument's topic neither undermine nor override the support of the stated premisses for the conclusion, as well as a generalization covering this premiss as well as the stated premisses. But such a place-holder is a fig leaf covering up the reality of non-conclusive support, since in general there is no way of supporting the place-holder with a formally valid inference from justified reasons. Thus there needs to be some account of the conditions under which non-conclusive support by appeal to criteria or considerations can be inferentially adequate.

"Validity in conductive arguments" is an early and flawed attempt at providing such an account. A revised version of a paper presented at the Third International Symposium on Informal Logic in 1989, it is my first attempt to extend the approach of my paper "Enthymematic arguments" (Hitchcock 1985), written in 1986, to arguments whose premisses provide less than conclusive support for their conclusion. It suffers from accepting my early substitutional and interpretational conceptions of material consequence and from failing to require that a covering generalization corresponding to a materially valid scheme must support counterfactual instances. It was on the right track, I believe, in allowing for a process by which the assumed positive or negative relevance of a criterion or consideration could be challenged by citing parallel counterexamples, and by which such challenges could in turn be met by distinguishing a supposed parallel counterexample from the case at hand. It was a mistake, however, pointed out by Kock (2007), to take a single relevant criterion or consideration to establish a presumption that the conclusion should be accepted. If someone has a symptom mentioned in the definition of a psychiatric disorder, that fact is relevant to concluding that they have the disorder, but if the definition requires possession of at least five symptoms from the list, possession of one of them does not create a presumption that the person has the disorder. Similarly, if legalizing voluntary euthanasia runs the risk of creating a system that pressures vulnerable people into agreeing to be put to death, that fact does not create a presumption against legalizing voluntary euthanasia. Rather, it should prompt refinement of the proposed legal regime so that it includes adequate safeguards against such pressure. It is an outstanding issue how to characterize the positive or negative relevance of a criterion or consideration without taking it to create a presumption for or against the conclusion to which it is relevant.

The example of refining a proposal to legalize voluntary euthanasia so as to protect vulnerable people points to a more fundamental inadequacy of my early treatment of appeals to criteria or considerations: it is static rather than dynamic. Wohlrapp (1998, 2011, 2014, 2008) has argued convincingly that, especially in cases where criteria or considerations point in opposite directions, one needs to take a dynamic approach to integrating them. In the case of an allegedly positively relevant criterion or consideration, one should consider how an opponent of the conclusion would deal with it; if a criterion or consideration is alleged to be negatively relevant, one should consider how a proponent would deal with it.

Wohlrapp went so far as to claim that, if one is still dealing with heterogeneous criteria or considerations, the discussion is incomplete.

The two other articles reprinted in the present part ("Appeals to considerations" and "'All things considered'") try to incorporate the dynamic perspective that Wohlrapp advocated. "Appeals to considerations" was written in late 2012 by invitation for a special issue of *Informal Logic* honouring the significant contributions to informal logic of Trudy Govier. The chapter thus focuses specifically on Govier's extensive treatment of such reasoning in scholarly articles and in the many editions of her textbook. In departing from her approach, it was at the same time departing from the approach of the earlier article on conductive arguments. It argued that the form of reasoning was better described as an appeal to considerations or to criteria than as conduction. The considerations or criteria cited are features of a subject of interest, and the conclusion drawn from them is the attribution of some supervenient status to that subject, such as a classification, an evaluation, a prescription or an interpretation. The conclusion of such reasoning may follow either conclusively from its premisses or non-conclusively or not at all. Weighing the pros and cons, however construed, is only one way of judging whether the conclusion follows, and perhaps only a last resort in making such judgments. Further, the move from information about the subject's cited features to the attribution of a supervenient status is often but one moment in a more complex process, a move that is typically preceded by other reasoning moves and may be followed by still others. In a thorough discussion of the supervenient status of such a subject, the relevant considerations and counter-considerations would ideally be integrated in such a way as to take the sting out of the counter-considerations.

The chapter "'All things considered'", written in 2015 for a conference on practical reasoning, supplies the reflections on evaluating pros and cons reasoning that "Appeals to considerations" lacked. Because of the focus of the conference where it was presented, the chapter focuses on appeals to considerations in support of a policy recommendation. Its approach can however be extended to appeals to considerations or criteria in support of a classification, an evaluation or an interpretation. The approach is far different than that of "Validity in conductive arguments", which focuses on the evaluation by a somehow detached evaluator of a fixed argument appealing to considerations in support of a definite conclusion. Instead, "All things considered" takes the perspective of a group of people trying to make up their minds on some issue on the basis of all the considerations that they think relevant. The process is dynamic and subjective in the way that Wohlrapp has pointed out. In general, diverse considerations may be relevant to deciding what to do (or how to classify, evaluate or interpret something). People may disagree about the importance or even the relevance of a given consideration. The chapter describes a number of reasonable ways of taking such diversity into account: comprehensive listing of considerations, assessment of the acceptability and relevance of each consideration, reframing, adjusting the option space, debiasing, estimations of importance, and allocating the burden of proof. In any such discussion, there is no guarantee of reaching consensus on a reasoned judgment. But the prospect of a sound judgment is enhanced.

18.3 Reasoning by Analogy

"Reasoning by analogy: A general theory" was written in 1989 as a contribution to an invitation-only workshop on the generalizability of critical thinking, with the resulting book published in 1992. The theme of the workshop dictated the framing of the chapter as an exploration of whether there was epistemological subject specificity with respect to the appraisal of arguments by analogy. The chapter concluded that there was no such subject specificity, i.e. that the same criteria applied across fields. I continue to accept this conclusion, for the reasons given in the chapter.

The primary motivation for choosing the topic of reasoning by analogy was the desire to extend earlier work on enthymematic arguments (Hitchcock 1985, 1987). The chapter thus begins by articulating the concept of enthymematic or material validity in its early substitutional form. It would need revision to bring it into line with the more developed conception of a materially valid inference as one with a true covering generalization that supports counterfactual instances.

At the time of writing this postscript, I see no need to revise the chapter's position on the evaluation of reasoning by analogy. I regret that subsequent scholarly work on the topic has almost completely ignored it. The reason for its neglect may be its publication in a book on the generalizability of critical thinking rather than, for example, as a journal article.

To sum up the main points of the chapter: In arguing by analogy, we project a queried property from one or more source cases that share certain features (predictor properties) to a target case that also has those features. The strongest legitimation of such projections is the existence of a determination relation according to which the variables of which the predictor properties are values determine the variable of which the queried property is a value. If such determination relations are tight, as with the relation of the first letter of a Canadian postal code to the province of the address, they legitimate conclusive analogical inferences. If they are loose, as with the determination of the value of a piece of real estate by the sale price of recently sold comparable properties, they legitimate only probable or provisional analogical inferences.

Analogical inferences to a recommendation, evaluation, or classification can be legitimated by an insight into the relevance of the predictor properties to the supervenient queried property, an insight which may require only one source case to substantiate. In such inferences the premiss is not merely that the source has both the queried property and the predictor properties, but that the source has it by virtue of those predictor properties. Given such a premiss, the conclusion usually follows only provisionally, not conclusively.

Where there is no known determination relation and no insight into the supervenience in the source cases of the queried property on the predictor properties, the inferential connection can be made weakly probable by similarity-based criteria: greater numbers of sources, more similarities and fewer dissimilarities between the sources and the target, dissimilarities in other respects among the sources.

18.4 Practical Reasoning

Two chapters in this part concern reasoning about what is to be done: "Pollock on practical reasoning" and "Instrumental rationality".

"Pollock on practical reasoning" emerged from a longer conference paper (Hitchcock 2000) which drew attention to the development by the prominent American epistemologist John L. Pollock (1940–2009) of a computational architecture for a rational agent. Among other things, the conference paper:

- criticized Pollock's naturalistic construal of philosophical epistemology, on the ground that it subordinates epistemology unduly to the accidents of human evolutionary history;
- endorsed Pollock's less descriptive design approach, according to which rationality is a solution to such design problems as how to interact with one's surroundings to keep oneself in existence and perpetuate one's species;
- endorsed Pollock's claim that even a fully rational agent needs quick and inflexible routines for belief formation and practical cognition in situations where reasoning is too slow, the full rationality coming into play in giving priority to rationality when there is a reason to override the output of such "Q&I modules";
- endorsed Pollock's treatment of epistemic and practical cognition as distinct but inter-related, in that practical cognition depends on beliefs about the agent's current situation and epistemic cognition is interest-driven;
- endorsed Pollock's argument that a rational agent must engage in defeasible epistemic reasoning, such as reasoning from the way things appear to the way they are, from observed regularities to a universal generalization, and from 'most As are Bs and this is an A' to 'this is a B';
- accepted Pollock's important seminal distinction (Pollock 1970) between two types of defeaters of defeasible reasoning, a *rebutting defeater* that is a reason for denying the conclusion and an *undercutting defeater* that is a reason for denying the inference, in each case consistently with accepting the reasoning's premisses;
- endorsed Pollock's argument (Pollock 1995, pp. 95–99) that "generic Bayesianism", according to which our epistemic attitude towards a proposition should be determined by its probability, is self-defeating;
- noted Pollock's "weakest link principle" according to which the degree of support for a conclusion is in deductive reasoning the minimum of the degrees of support of its premisses and hence in defeasible reasoning the minimum of the strengths of its prima facie reasons and of its input states;
- expressed tentative support for Pollock's somewhat surprising claim that independent arguments for the same conclusion do not increase the strength of support for it beyond that given by the strongest of those arguments;
- praised the subtlety of Pollock's account of when inferences are defeated; and
- noted Pollock's distinction between justification (support by an undefeated node of the inference graph of a sequence of epistemic reasoning) and warrant

(justification at every stage after some stage in a sequence of reasoning from a given input).

I continue to have much the same reactions to Pollock's position on these issues.

Pollock will perhaps best be remembered for his work on defeasible reasoning, on which he continued to write in his last years (Pollock 2007, 2009, 2010). In a fine appreciation of his contributions to the computational study of argument, Prakken and Horty (2012) note that Pollock proposed one of the first non-monotonic logics with explicit notions of argument and defeat, introduced the important distinction between rebutting and undercutting defeat, was the first in the field of artificial intelligence to regard defeasible reasons as general principles of reasoning, was the first to use a labeling approach in the semantics of argumentation, took self-defeating arguments more seriously than anyone else, took argument strength seriously, and raised the issue of modeling degrees of justification. They note the benefits of Pollock's grounding of his theories in his work on epistemology. At the same time, they regard as limitations that his work on suppositional and resource-bounded reasoning has not survived, that his failure to explicitly distinguish between attack and defeat sometimes leads to confusion, that he modeled epistemic reasoning argumentatively but not normative or practical reasoning, and that he never envisaged incomparable strengths of defeasible reasons or defeasible reasoning about the strength of defeasible arguments.

"Pollock on practical reasoning", reprinted in the present collection, assesses the strengths and weaknesses of the system of practical reasoning in Pollock's computational architecture for a rational agent. Pollock teaches us, I still think, that practical reasoning requires not only beliefs and desires, and not just intentions as well, but also likings and dislikings; and that a variety of transitions between such mental states are subject to rational criticism. At the same time, I still think, his model is incomplete in not allowing for communication between rational agents, social cooperation, or the recognition of moral constraints.

My subsequent paper on practical reasoning (available at https://www.researchgate.net/profile/David_Hitchcock2/publication/2823094_Statement_on_Practical_Reasoning/links/0046352cdee21da385000000.pdf; accessed 2016 08 12) served as input to a collaborative article on decision support for practical reasoning, in which we recommended that:

> a decision support system be used for the guidance of agents, singly or in groups, in deciding in a wide range of domains what is to be done. Whatever the system, it should be based on argumentation, and transparent in that respect to any user. The basis for the system should not be Spartan in its use of argumentation schemes and techniques. It should reflect the richness of quality argumentation, and should use the techniques appropriate to the domain in which it gives advice. There should be an openended approach to advising, and users should be able to deliberate jointly with the system about advice and how it is generated. The interactive interface between agents and the machine should facilitate the giving of advice and the joint activities of system and agents (Girle et al. 2003, p. 83).

These recommendations still seem sensible to me. In particular, I continue to think that practical reasoning takes many forms, not just means-end reasoning about how

to achieve an agent's goal. This pluralism shaped further work with Peter McBurney on a framework for deliberation dialogue, i.e. a dialogue about what is to be done (Hitchcock et al. 2002; McBurney et al. 2007). In this paper we

> proposed the first formal model of a general deliberation dialogue, grounding it in the philosophy of argumentation and using a dialogue-game framework to ensure implementability. Our model creates a public space in which multiple participants may interact to jointly decide on a course of action, and our structure and rules seek to define the nature of these interactions (Hitchcock et al. 2002, p. 13).

The framework allowed as non-factual inputs goals, perspectives, evaluations and constraints. This pluralism made it difficult to construct soundness and completeness proofs. Subsequent work in artificial intelligence has instead followed Walton (1990, 1996) in treating practical reasoning as goal-directed, with the important addition of values that goals are supposed to embody (Atkinson et al. 2006; Atkinson and Wyner 2013; Atkinson and Bench-Capon 2016).

João Sàágua and Michael Baumtrog (forthcoming) have proposed an integrated model intended to simultaneously describe and provide norms for all forms of practical reasoning and argumentation. Baumtrog (2015, p. 59) nicely represents the five stages of this model in a flow chart. Practical reasoning or argumentation begins at stage 1 with a reason for pursuing a goal. Given that an agent has or should have such a reason, at stage 2 the questions arise whether the goal is compatible with other goals that the agent has or should have and if not whether it is preferable to the goals with which it is incompatible. Given an affirmative answer to either question, the question arises at stage 3 whether there is a set of means that are jointly sufficient for realizing the goal. Given an affirmative answer, at stage 4 the same questions arise about the means as arose at stage 2 about the goal. Given an affirmative answer to either question, at stage 5 the agent takes action. A negative answer at stages 1 through 4 leads to a decision to take no action or to modify and repeat. Answers to the various questions are arrived at through the use of argumentation schemes with their critical questions, of the sort set out in (Walton et al. 2008). The main line of reasoning in support of taking some action could be set out in the following scheme:

1. I have or should have a reason for pursuing G.
2. Means M1, …, Mn are sufficient for achieving G.
3. G and M1, …, Mn are preferable to any goals incompatible with them that I do or should have.

Therefore, C I do or should implement M1, …, Mn.

Sàágua and Baumtrog make their claim to universality plausible by construing the term 'goal' broadly to include features constitutive of the so-called 'means' that brings it about. For example, telling the truth on a particular occasion is construable as a means of achieving the goal of being truthful. They also build into the subsidiary argumentation schemes in their model considerations (such as the achievability of the means) that appear directly in other schemes for practical reasoning. Despite this comprehensiveness, there are reasons to hesitate before accepting their

claim to the universality of their model. First, it can be reasonable not to pursue a goal that one has a reason to pursue, simply because the reason is not that compelling; I might for example have a reason to talk to a friend whom I have not seen for some time, but I just don't feel like doing it now. Second, there can be more than one set of means that satisfies the conditions of the scheme, but it hardly seems reasonable to implement two sets of means when each set is sufficient for achieving the goal. Third, there are occasions when it is reasonable to implement means that are not sufficient for achieving a goal, because they have the best chance in the circumstances of helping to bring about the goal. Fourth, the model allows for dynamism only when there is a negative answer at any of stages 1 through 4, but a dynamic process of reconsideration or interpersonal discussion can be appropriate for other reasons.

The second paper on practical reasoning reprinted in the present collection, "Instrumental rationality", focused on the kind of goal-directed reasoning about what is to be done that many people identify with practical reasoning in general. A main motivation for writing this paper was to point out that instrumental rationality, i.e. the rational selection of means for achieving a given goal, is more complex than many theorists acknowledge. The focus on means-end reasoning did not constitute an abandonment of pluralism about forms of practical reasoning. Not only does the chapter begin by drawing attention to this pluralism; its scheme for means-end reasoning accommodates it in several ways: in the critique of the initiating intention to pursue a goal, in the consideration of moral or institutional constraints on the selection of means, in the judgment of comparative preferability of alternative effective means, and in the evaluation of side-effects of a contemplated means. Thus there is much more to instrumental rationality than finding an effective means of getting to a chosen goal. One needs to make sure that the goal is achievable and that the means is permissible. One should ideally determine that no alternative means is preferable and that the side effects do not outweigh the benefits of achieving the goal, provided that the decision is important enough to justify the time and resources required to make these determinations. Short of such a thorough investigation, one might provisionally embrace an inferred means as a sub-goal and then do a quick check for a better means or possible unwelcome side-effects before making one's decision final.

Kvernbekk (2014) objects that, when applied to educational interventions, the proposed scheme does not accommodate the role of interaction between students and the environment in bringing students to a chosen goal. Ultimately, as goal-directed theories emphasize, it is the students who work towards an educational goal, as they interact with their environment. A goal-directed theory (Norris and Kvernbekk 1997) is a model of an abstract system in which an individual can achieve a goal as the result of a sequence of events causally mediated by the individual's own efforts and features of the individual's environment. Their example is a theory of science education known as constructivism, which among other things models how students can learn conventional scientific explanations. Suppose that the goal is knowledge of the scientific explanation of density. The constructivist theory provides an abstract model of how various parameters in the student and the student's environment can

work together to bring the student from ignorance of what density is and what factors affect it to knowledge. In constructivist science education, students are supposed to work out the explanation through discussion and guidance by the teacher, rather than simply being told in a didactic lecture. The teacher and the students have the same goal: that the students understand the conventional scientific explanation of density. But the students are not engaging in means-end reasoning; they are trying to figure something out, in a kind of group problem-solving exercise. Getting from ignorance to knowledge about something can be an exercise in means-end reasoning, as when one does a Google search on the Web to find the answer to one's question; the Google search is a means of achieving the goal of knowledge. But figuring something out by oneself is only sometimes a matter of means-end reasoning. For example, one aspect of arriving at the correct explanation of some phenomenon or event is the generation of hypotheses that would explain it. Knowledge that brainstorming in a group is an effective means of generating ideas might lead a group to decide to do some brainstorming. The group's decision arises from means-end reasoning that conforms to the scheme proposed in (Hitchcock 2011). But the subsequent back-and-forth exchange of ideas, although it is part of a process leading to the desired goal, does not involve means-end reasoning, except incidentally. Similarly, a dialogue among students in a science class about what density is and why some substances are more dense than others is part of a process leading to the goal of understanding the conventional scientific answers to these questions, but a given student's contribution to the discussion at a certain point is not arrived at by reasoning from the goal of understanding density to the selection of a means that would achieve the goal. It is thus quite correct that the scheme for means-end reasoning does not capture the dynamics of the process of group discussion that leads to improved understanding. Nor should it be expected to. The dynamic processes captured in goal-directed theories are thus complementary to the kind of reasoning from end to means for which the scheme in (Hitchcock 2011) is proposed.

On the other hand, a teacher who is applying the constructivist theory of science education may well engage in means-end reasoning in structuring the environment in which the students are to work towards an understanding of some phenomenon. The theory will provide a basis for selecting as an effective means for producing this understanding some combination of didactic instruction, discussion among students in small groups, and hands-on practical activities with provided materials. What needs to be acknowledged is that the means chosen may be complex and multi-faceted, and that they may bring about the desired effect through a process. This acknowledgement seems to be a clarification of the scheme for practical reasoning in (Hitchcock 2011) rather than a change to it.

Kvernbekk (2014) also points out that in educational settings the means is often chosen for rather than by the teacher who implements it. Her example is school-wide positive behaviour interventions and supports (PBIS), a framework for preventing and minimizing student misbehaviour. One may think of a school's adoption of this framework as selection of a means of improving "social, emotional

and academic outcomes for students with disabilities",[6] as the United States Department of Education rather vaguely describes the goal. But adoption of the framework is only the beginning of a process of choosing a representative team to work out a specific plan for their school, see that it is implemented, monitor how it is being implemented, assess the results, and make adjustments as needed. This process involves considerable scope for means-end reasoning, which the scheme in Hitchcock (2011) appears to fit. Further, the scheme allows that the person doing the means-end reasoning may not be the same as the person who is to carry out the means. The result of a person or group's means-end reasoning may be a decision to advise or urge or order someone else to implement the means.

Thus Kvernbekk's remarks in her (2014) seem to provide no reason to modify the scheme proposed in Hitchcock (2011) for means-end reasoning, except to note that the means chosen may be complex and that its contribution to achievement of the chosen goal may involve a lengthy process with its own internal dynamic. At the same time, there is no proof that the proposed scheme is sound, in the sense that any instance of the scheme will have a reasonable conclusion if the chosen goal is reasonable and the other premisses are correct. Indeed, it is hard to know what such a proof of soundness would look like.

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Part IV
Interpersonal Discussion

Chapter 19
Some Principles of Rational Mutual Inquiry

Abstract In mutual inquiry two or more people seek rational agreement on an answer to an open question. Rules for a dialogue system for mutual inquiry should conform to at least the following 18 principles: externalization, dialectification, mutuality, turn-taking, orderliness, staging, logical pluralism, rule-consistency, semantic openness, realism, retractability, role reversal, experiential appeal, openness, tentativeness, tracking, termination rules, allocation of burden of proof.

19.1 Prescriptive Dialectical Systems

A dialectical perspective on argument and reasoning treats them as activities which take place in dialogues, i.e. in conversations between persons. A rhetorical perspective, by contrast, treats them as activities of a speaker or writer who aims to secure or intensify adherence by listeners or readers to a point of view. A third perspective treats them as essentially private acts of working out for oneself the truth of the matter; we might call this perspective epistemological. There may be other perspectives.

Since we do in fact argue and reason in all these ways, all three perspectives have their place. Within a dialectical perspective, in particular, researchers can describe, explain or prescribe how people argue with one another or reason together. My own perspective in this chapter will be dialectical and prescriptive; I will be recommending how people should reason together.

Prescriptive dialectical systems have a long history. They include systems for conducting legal proceedings, Socratic inquiries, medieval disputations, parliamentary debates, discussions of academic papers, negotiations, mediation sessions, and arbitration hearings. Some are or have been actually practised, others are purely

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theoretical. Some are loosely defined, others more tightly defined. Some are explicitly characterized, others are implicit in routinized practices.

What is the value of such systems? After all, any such system limits the freedom of interlocutors to say what they like when they like and to whom they like. The restraints of such a system, it may be answered, can help the interlocutors to accomplish goals which they would be unlikely to achieve in a free-for-all. A court proceeding which was as meandering and inconclusive as most everyday conversations, for example, would probably not be a fair trial, and the perceived injustice of the procedures would undermine acceptance of the verdict reached by them.

This answer tells us how to evaluate proposed prescriptive dialectical systems, namely, by their effectiveness in enabling their users to achieve the goal or goals for which the system is designed. One goal of Socratic inquiry, for example, is to test the answerer's claim to know something. It is a good system with respect to that goal if a skilled questioner following its rules is likely to refute a skilled answerer who does not know but unlikely to refute one who knows. An alternative system which made refutation of the ignorant more likely and of the knowing less likely would be a better system, whereas one with the opposite properties would be worse.

Estimating the comparative effectiveness of a system in enabling interlocutors to achieve a goal would require either theoretical or empirical investigation, or both. A theoretically determinable property, for example, is rule-consistency—the absence of any possible circumstance in which the rules would prohibit all acts, including the null-act (Hamblin 1970, p. 258). A property requiring empirical investigation is the likelihood that procedures for examining and cross-examining eye witnesses in a criminal proceeding will elicit accurate reports, establish their credibility, and undermine the credibility of any inaccurate reports.

Contemporary dialectical systems tend to be adversarial. Such systems as those of Lorenzen and Lorenz (1978), Rescher (1977), Barth and Krabbe (1982) and van Eemeren and Grootendorst (1984) follow the tradition of medieval disputation which goes back to Aristotle. They postulate a proponent who advances a thesis at the beginning of the conversation and an opponent who strives to refute the thesis or challenges the proponent to prove it on the basis of concessions grudgingly granted. I shall call conversations with such a pair of characters *disputations*. If the proponent defends her thesis she wins and the opponent loses, but otherwise the opponent wins and the proponent loses. Since each participant in such a dialogue is striving to win,[1] their immediate objectives are incompatible. Ego-involvement will tend to make them quarrelsome, stubborn, unwilling to see the other person's point of view, unwilling to make concessions, devious, and so forth. It may do so even if they share a commitment to the purpose for which the system is designed, e.g. to

[1]We can get a good idea of the victory-oriented psychology of disputants from Book VIII of Aristotle's *Topics*, which gives advice to the questioner and answerer. The questioner is to use such tactics as arranging the order of questions so that the answerer does not realize the implications of the admissions he is making. There is little to distinguish such trickery from the eristic disputation which Aristotle stigmatizes. The same psychology appears in the contemporary practice of student debating, which is descended from medieval disputation.

test critically hypotheses put forward for acceptance. While there will be occasions when engagement in such adversarial conversations is necessary and even desirable, the psychological effects just described indicate that it is preferable, in the absence of overriding reasons to the contrary, to use less adversarial, more cooperative procedures Such alternative procedures would permit both participants to emerge victorious from their discussion.

19.2 Mutual Inquiry

One kind of conversation for which cooperative procedures seem appropriate is what I shall call *mutual inquiry*. Its main purpose is to secure rational agreement by the participants on the answer to a specified question. A subsidiary purpose, if they do not come to agree on an answer, is to secure agreement on why they have not succeeded in answering their question.[2] Mutual inquiry can occur in such contexts as collaborative research and negotiation. Since fruitful collaborative research and negotiation have important theoretical and practical benefits, it seems worthwhile to try to work out desirable rules for mutual inquiry.

In this brief chapter, I shall not descend to the detailed level of rules. Rather, I will propose and defend principles to which roles for mutual inquiry should conform. For the sake of simplicity, I assume a conversation with two participants.

The following principles have occurred to me. I make no claim for their completeness.

Externalization: The rules of mutual inquiry should be formulated in terms of observable linguistic behaviour, rather than in terms of mental attitudes, states and acts. Only in this way can an observer tell whether the rules are being followed.

Dialectification: In so far as possible, the participants should work out by verbal agreement among themselves the content of their conversation. This principle implies that they should begin their conversation with no commitment to any data or method, and that they should acquire such commitments through explicit agreement as the conversation proceeds. Furthermore, the rules should prescribe only the most minimal logical apparatus possible, leaving the participants free to commit themselves verbally to specific rules of inference. Mutual inquiry is in the hands of the inquirers, and a system of rules which tried to impose advance commitments (like the pre-conversational concessions of Lorenzen's dialectical logic) or rules of inference (like the stipulated warrants of Rescher's system of formal disputation) would simply be rejected where it did not fit the inquirers' wishes. As Hamblin notes (1970, p. 283), the authority for dialectical rules is the dialectical participants themselves.

[2]Following the principle of externalization articulated by Barth and Krabbe (1982, p. 60) and by van Eemeren and Grootendorst (1984, pp. 4–7), I formulate the goals in terms of mutual agreement rather than mutual understanding.

Mutuality: No sentence becomes a commitment of the inquirers until they both explicitly accept it. This principle is a consequence of the goal of mutual agreement, which would be frustrated if either participant could advance the discussion with the aid of a sentence to which the other participant had not agreed. The principle distinguishes mutual inquiry from disputation, which allows participants to use their adversaries' concessions in making inferences, even though they themselves have no commitment to them.

Turn-taking: At most one person speaks at one time. I shall use the word *turn* for a stretch of time in which exactly one of the parties in the discussion is entitled to speak and that is not immediately preceded, or immediately followed, by some other stretch of time in which the same party is entitled to speak.[3] In the first turn, one person invites another to join in a mutual inquiry. Subsequent turns end when the participant has introduced one further matter which requires agreement or indicates completion of the turn, whichever comes earlier.

Turn-taking is such an obvious requirement of productive discussion that few dialectical systems explicitly mention it. Yet everyday conversations often violate the principle: people interrupt each other, speak while another person is speaking, and make long speeches without giving their interlocutors the chance to challenge tendentious claims. Such practices express apparent disrespect for one's interlocutor, and make impossible the step-by-step agreement aimed at in a mutual inquiry.

Orderliness: As far as possible, the permissible locutions during a turn should each open up at most one choice-point for the respondent. Such a restriction avoids loose ends, matters which one participant wanted to discuss but had to set aside in order to deal with some other matter which arose in the same turn. In an orderly mutual inquiry one issue is raised at a time and resolved before another issue arises. Such a step-by-step approach need not limit participants to one (simple or complex) illocutionary act per turn, as van Eemeren and Grootendorst do (1984, p. 173). An interlocutor might, for example, use a single turn both to express agreement with the immediately preceding speech act and to make a suggestion for further development of the reasoning.

Staging: By a stage I mean a sequence of turns in which the rules are designed to promote agreement on some component of the process of reaching agreement on the answer to a specified question, and which is neither immediately preceded nor immediately followed by a turn whose applicable rules contribute to that component. A mutual inquiry should follow a sequence of stages which is invariant unless the participants retrace their steps. The invariant order is due partly to the dependence of some components on the completion of others; for example, one cannot clarify a question until one has given it an initial formulation. It is also due, as will become clear later, to the principle of orderliness mentioned above.

[3]Compare the concept of a stage in Barth and Krabbe (1982, p. 63).

A successful rational mutual inquiry proceeds as follows:

Opening: The participants agree to seek together an answer to a question raised by one of them.

Clarification: The participants jointly clarify the question.

Warrant: The participants agree on what sort of evidence or argument would produce an answer to the type of question with which they are dealing. (Cf. Toulmin (1958) and Fisher (1988).)[4]

Design: The participants agree on what sorts of data (Toulmin 1958) their warrant indicates arc relevant, and on how to gather them.

Data-gathering: The participants collect the data which they have decided are relevant, and agree on what the data are.

Tentative conclusion: The participants agree on what answer to their question provisionally follows from their data in the light of their warrant.

Rebuttals: The participants may consider some possible conditions of exception (Toulmin 1958) to their warrant and agree that they do not obtain,

Closing: The participants confirm the tentative conclusion.

[4]In using Toulmin's concept of a warrant (1958), 1 implicitly adopt a minority conception of how inference works which goes back to the medieval notion of material consequence. A modern version of this notion comes to us from the 19th century philosopher Bernard Bolzano, through George (1983), who has strongly influenced my own work (Hitchcock 1985, 1987). Toulmin's conception of a warrant comes immediately from Ryle's conception of an inference-license (Toulmin 1958, p. 260). An inference-license or warrant is a general principle in virtue of which one can draw a conclusion from certain premisses. (In Toulmin's vocabulary, it permits one to support a claim by appealing to certain grounds.) It is an answer to the question: How do you get there (i.e. from the premisses to the conclusion)? The tradition coming from Bolzano makes explicit that the warrant is a covering generalization. One forms the conditional whose antecedent is the conjunction of the argument's premisses and whose consequent is the conclusion. Then one generalizes with respect to one or more repeated content expressions, at least one of which must occur both in the premisses and in the conclusion. Often one can simplify the resulting cumbersome expression.

If some covering generalization of this sort is true without exception, the argument has a conclusive inference. That is, the truth of the generalization rules out the possibility that the premisses are true and the conclusion false. With such inferences, the principle of orderliness articulated below is consistent with securing agreement first on the premisses and then on the conclusion, since there is only one issue up for discussion when one participant draws the conclusion, namely whether there is a true exceptionless covering generalization.

As Toulmin notes, however, the warrant may hold only in some modally qualified way—probably, presumably, or possibly. (Rescher (1977) likewise recognizes non-conclusive plausible reasoning.) In these cases, as I have argued elsewhere (Hitchcock 1992, 1994), the warrant is a modally qualified covering generalization. A conclusion drawn in accordance with such a modally qualified warrant must be scrutinized not only on the basis of whether the qualified generalization is true but also on the basis of whether any condition of exception obtains in the case under discussion. So if one secures agreement on the premisses and then draws the conclusion, the turn in which the conclusion is drawn will give rise to two issues at once: whether the warrant is acceptable and whether any condition of exception obtains. So the principle of orderly discussion indicates that the participants should agree to the warrant first, then agree to the premisses, and finally consider whether any condition of exception obtains.

Logical pluralism: In accordance with the principle of dialectification, the rules of mutual inquiry should permit both conclusive and non-conclusive inference, since we draw inferences in both these ways. By a *conclusive inference* I mean one which categorically excludes the possibility that the premisses are true and the conclusion false. A non-conclusive inference excludes this possibility only provisionally or with probability. I use 'conclusive' rather than 'deductive' in accordance with a theory of inference articulated elsewhere (Hitchcock 1985, 1987, 1992, 1994).

Such pluralism contrasts with the logical monism of other contemporary dialectical systems. The dialectical logic of the Erlangen school (Lorenzen and Lorenz 1978), elaborated by Barth and Krabbe (1982), is formal deductive logic dressed in a dialectical garb.[5] Van Eemeren and Grootendorst assume in their discussion of unexpressed premisses (1984, p. 134) that a thesis can only be justified by a valid argument, by which they appear to mean a formally valid argument. Rescher's system permits *ceteris paribus* reasoning (1977, pp. 6–8) but not deductive reasoning. For a logically pluralistic dialectical system, we have to go back to Aristotle, who writes in *Topics* VIII about a system which allows both conclusive syllogisms and non-conclusive inductive generalization.

Rule-consistency: The rules should be consistent in Hamblin's sense (1970, p. 254) that there is no possible situation in which they both permit and prohibit the same locution, or equivalently in which they prohibit all acts, including the null-act.

Semantic openness: In accordance with the principle of dialectification, the system should be semantically open in Hamblin's sense (1970, p. 259) that no participant can be forced to accept any sentence, even a (supposedly) logically true sentence. In particular, the rules must allow either participant to criticize a question at the clarification stage, because to pose a question is to assert the disjunction of its possible answers, which are its presuppositions (Carlson 1983).

Realism: The rules must make it a realistic possibility that two people who are willing to commit themselves to clarifications, warrants, data-gathering techniques, and rebuttal conditions which lead to a certain answer to their question will in fact arrive at that answer. Compare Barth and Krabbe's analogous general norm for systematic dialectics (1982, p. 61).

Retraceability: At any turn either participant should be free to supplement, change or withdraw an earlier tentative commitment. Since the success or failure of a mutual inquiry is a mutual success or failure, not a win for one participant and a loss for the other, such a retracing of steps is unlikely to be obstructive, since there is nothing to gain from obstruction. On the contrary, for example, the need for additional clarification of the question may only have become apparent as the

[5]In fact, conversations in Barth and Krabbe's system are not particularly dialectical, since the concessions of the opponent to which the proponent can appeal after his thesis is analyzed using strip rules are not agreed to during the conversation, but antecedently attributed to the opponent. Nor are the strip rules agreed to in the conversation. The system is in fact dialectical in garb only; it is dialectical window-dressing for Beth's method of semantic tableaux for determining whether a specified conclusion follows logically from specified premisses.

conversation proceeds. Such backtracking need not require starting all over again at that stage; it may be sufficient for the interlocutors to agree that their intermediate agreements still stand and to return forthwith to where they were. The participants should be able to check for inconsistencies before they do so.

Such liberalism about retraction would be a disaster in a disputational system, since it would allow an obstructive proponent to avoid refutation indefinitely, and thus leave theses subject to too weak a test.

Role reversal: The rules should permit the responsibility for initiating suggestions to shift from one participant to the other. Otherwise the conversation is likely to be a monologue in all but form, with suggestions accepted unquestioningly.

Experiential appeal: The rules should permit direct mutual appeal to experience, especially in the data-gathering stage. In this way the system will avoid the vice of such dialectical systems as medieval disputation, which seemed to presuppose the possibility of arguing for any position without any empirical evidence other than texts cited as authorities.

Openness: At any turn where a participant has a right to make a certain kind of suggestion, there is no restriction on which suggestion of that kind it may be. Thus there are to be no extra-conversational restrictions on how the parties can clarify a question, decide on how to answer it, collect data, and so forth. Such liberty of discussion prevents extraneous blockage of promising paths of inquiry.

Tentativeness: Rather than making assertions, participants in a mutual inquiry put forward suggestions. These become tentative commitments of both participants if the other one accepts. Only if the conversation proceeds to a successful closing stage do those tentative commitments become definite. This tentativeness is more than a matter of the words one uses to express one's point. The difference between an assertion, a suggestion, a tentative commitment, and a firm commitment must be analyzable in terms of their dialectical roles. "In the long run, whether a given locution is or is not a statement, question or the like depends upon its place in a dialectical system, and not vice versa." (Hamblin 1970, p. 259) An assertion entitles its hearer to request a justification of it and conditionally obliges the assertor to justify or withdraw it. The author of a suggestion, by contrast, has not even a conditional obligation to defend it. Compare Rescher's contrast (1977) between a cautious assertion and a categorical assertion.

The absence of initial commitments in a mutual inquiry and the tentativeness with which the interlocutors move through the stages are meant to promote open-mindedness and to avoid ego-involvement with an answer to which a person has declared a commitment. Participants may have unexpressed convictions about the question under discussion, but should be prepared to revise their convictions.

Tracking: The rules should make it possible to determine at any turn the cumulative commitments, rights and obligations of each participant. Compare Barth and Krabbe's norm of orderly dialectics (1982, p. 77), as well as the detailed list of permitted and prohibited speech acts in van Eemeren and Grootendorst's code of conduct for rational discussants (1984, Chap. 7).

Termination rules: An inquiry terminates as soon as (1) a participant declares an intention to abandon it, (2) in two successive turns neither participant has a

suggestion for consideration, or (3) there is agreement at the closing stage on the conclusion. In the first case, the inquiry has been totally unsuccessful. In the second case, the participants have failed to achieve their main goal but have succeeded in achieving their secondary goal of agreeing on the source of the failure to answer their question: failure to reach agreement on the desideratum at the stage where the inquiry terminated. In the third case, the inquirers have succeeded in achieving their main goal.

Allocation of burden of proof: If one participant makes a suggestion and the other uses the next turn only to decline to agree with it, the first participant may begin to suggest a groundwork for acceptance of the declined suggestion, but may not ask for justification of the refusal to accept it. 1n other words, the burden of proof rests with the person who makes a suggestion, not with the person who declines to accept it.

A provisional warrant or presumption, as Toulmin (1958) points out, is tied to more or less explicit conditions of exception or rebuttal. It has the form of Toulmin's example: A man born in Bermuda will generally be a British subject unless both his parents were aliens or he has become a naturalized American or …. In accordance with the principle of dialectification, in a mutual inquiry the participants will decide by the content of the warrant on which they agree which conditions are built into the provisional generalization and which conditions constitute the absence of exceptions. If a condition is built into the warrant (e.g. being a man born in Bermuda), the participants must agree on the fulfilling of that condition in a particular case before applying the warrant to draw a tentative conclusion. But participants need not agree on the absence of any specific condition of exception in a particular case before transforming their tentative conclusion into a firm one. It is up to them to agree on which conditions of exception to consider.

19.3 Conclusion

Some may be suspicious of a system of mutual inquiry as a device for advancing knowledge. Such distinguished philosophers as Popper (1968, p. 16), Barth and Krabbe (1982, pp. 25–26) and Rescher (1977, pp. xii–xiv) hold that controversy is crucial to the growth of knowledge. People's claims must be put to the severe test of critical examination by others in an adversarial disputation.

The more cooperative system of mutual inquiry may be thought by contrast to be intellectually soft. All is to be sweetness and light, and it will be too easy to accept dubious suggestions because they move the inquirers toward their goal. Just as cooperative games do not enlist the skills of their players as intensely as competitive games, so mutual inquiry is unlikely to enlist such important rational skills as counter-exampling and considering alternative explanations. Supposedly mutual inquiries may turn out to be monologue dressed up in dialogue form as the passive participant simply nods agreement to whatever suggestions the other interlocutor puts forward.

Such intellectual softness and pseudo-dialectic are real dangers. One protection against them is a strong extra-systematic interest in a rational termination of the inquiry. Collaborating researchers, for example, have an interest in discovering the truth, and perhaps an even stronger interest in avoiding the ignominy of public refutation once they publish the results of their research. Negotiators have interests which they wish to see maximally accommodated in their agreement. Another protection against pseudo-dialectic is the principle of role reversal, which makes it less likely that one participant will be hypnotized into thoughtlessly repeating, "Yes. I agree."

One can point to successful practices of mutual inquiry which conform more or less to the principles articulated above, such as the sort of joint decision-making which occurs in Japan and the system of principled negotiation recommended by Fisher and Ury (1983).

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Chapter 20
The Practice of Argumentative Discussion

Abstract I propose some changes to the conceptions of argument and of argumentative discussion in Ralph Johnson's *Manifest Rationality* (2000). An argument is a discourse whose author seeks to persuade an audience to accept a thesis by producing reasons in support of it and discharging his dialectical obligations. An argumentative discussion (what Johnson calls 'argumentation') is a sociocultural activity of constructing, presenting, interpreting, criticizing, and revising arguments for the purpose of reaching a shared rationally supported position on some issue. Johnson's theory of argumentative discussion, with occasional modifications, is derived from this definition as a sequence of 17 theorems. Argumentative discussion is a valuable cultural practice; it is the most secure route to correct views and wise policies.

In his *Manifest Rationality*, Johnson (2000) singles out for attention a practice he calls argumentation, "the sociocultural activity of constructing, presenting, interpreting, criticizing, and revising arguments." (12, 154[1]) I propose to reconstruct the structure of Johnson's thinking about this practice, to give reasons for generally endorsing that thinking, to propose some alterations to it, and to explain why the practice is valuable.

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[1]Page references here and in what follows are to Johnson (2000). Johnson omits the word 'criticizing' in the second place cited.

D. Hitchcock, *On Reasoning and Argument*, Argumentation Library 30,
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20.1 Some Species of Argumentation

The definition quoted above presupposes that there is exactly one sociocultural activity, perhaps occurring at many times and places, which incorporates the dimensions mentioned in a single whole. It is a socially established cooperative activity with internal standards of excellence (155), analogous in this respect to the practice of exchanging gifts on some festive occasion. The activities of those engaging in it receive their intelligibility within the practice (155), but the practice as a whole needs to be understood within the customs, habits and activities of the broader society (154).

Is there a practice of the kind Johnson defines? Perhaps surprisingly, he cites no examples. He does cite some (alleged) products of the practice: an argument against a novelist's characterization of a city as grimy (33), a defence of a university president's refusal to fire a controversial professor (33–34), and Immanuel Kant's *Critique of Pure Reason*, construed as an argument that the faculty of reason is limited and cannot prove metaphysical theses (35). The interchanges in which these arguments are embedded, however, do not at first glance exhibit the features of one person interpreting and criticizing an argument and the argument's author revising it in response to this criticism, features which are constitutive of the practice of argumentation as Johnson defines it. We are given some examples of issues which may be addressed by arguments deployed within the practice of argumentation (alcoholism (303), litter (308), cigarette smoking (308), and casinos (309)), but no examples of arguments on such issues embedded in the kind of practice presupposed by Johnson's definition.

I therefore cite six species of the practice of argumentation as he defines it. First, people express their opinion about some issue and support it by reasons in letters to newspaper editors, radio phone-in shows, Internet discussion groups, panel discussions on television shows and so on; they interpret others' arguments, criticize them, and modify their own arguments in the light of criticism. Second, referees of journal submissions and book manuscripts interpret authors' arguments, criticize them and propose revisions which the authors either reject with reasons or accept. Third, scholars and scientists discuss in publications and at conferences such issues as the health effects of tobacco smoking or the cause of AIDS or whether reasons are causes. Fourth, judges support their opinions with reasons, reasons which take into account the arguments advanced by attorneys on either side of a given case and in the case of dissenting opinions the opinions and arguments of the majority of the court. Fifth, families and friends discuss issues informally in back-and-forth exchanges. Sixth, at meetings groups of various kinds discuss issues before they make a decision.

These practices share the features of argumentation as Johnson defines it: a participant will construct and put forth an argument, another participant will interpret and criticize it, and the first participant will respond, perhaps by revising the argument. Each practice has internal criteria of intelligibility and internal standards of excellence which are similar enough that they can be regarded as species of a single well-defined genus. Thus the aforementioned presupposition of Johnson's definition has been established..

20.2 The Definition of Argument

A second presupposition of Johnson's definition is that we can identify what an argument is independently of recognizing instances of the practice of argumentation; otherwise the definition would be objectionably circular. Johnson himself offers the following canonical definition of argument:

> An argument is a type of discourse or text–the distillate of the practice of argumentation–in which the arguer seeks to persuade the Other(s) of the truth of a thesis by producing the reasons that support it. In addition to this illative core, an argument possesses a dialectical tier in which the arguer discharges his dialectical obligations (168).

This definition needs some changes to be acceptable. To avoid objectionable circularity, we need to remove the reference to the practice of argumentation. To accommodate arguments for courses of action (e.g. voting for candidate X or party Y), we should characterize the arguer's goal as securing acceptance of a thesis rather than recognition of the truth of a thesis; the predicates of truth and falsity simply do not apply to many theses for which people argue. We need to remove the (probably unintended) suggestions that an argument must include all the reasons which support the claim argued for and must include only reasons which actually support it. Finally, to make the definition intelligible in abstraction from its context, we need to spell out what is meant by "the Other(s)". These changes collectively generate the following revised definition:

> An argument is a spoken discourse or written text whose author (the arguer) seeks to persuade an intended audience or readership (the Other or the Others) to accept a thesis by producing reasons in support of it. In addition to this illative core, an argument possesses a dialectical tier in which the arguer discharges his dialectical obligations.

Dialectical obligations include responses to objections and consideration of alternative positions.

Johnson's definition has the consequence that a person does not produce an argument who merely adduces reasons in support of a thesis, but does not discharge her dialectical obligations. Such products often emerge from the six types of argumentation I listed above. Johnson calls them 'proto-arguments' (170); they lack a structural component which a full argument has..

20.3 The Definition of Argumentation

Removing from the definition of argument any reference to the practice of argumentation, in order to avoid circularity in the definition of the practice, has the consequence that arguments occur in other contexts than argumentation. In their summary arguments, for example, lawyers for the prosecution or plaintiff and for the defendant produce reasons in support of a central thesis (that the defendant should be found guilty as charged or held liable, or not) and may respond to

objections. So such lawyers produce arguments. But the act of advancing such arguments in an attempt to convince a judge or jury is not part of a practice of argumentation, according to Johnson (153), because it does not obey the fundamental principle internal to this practice that the strength of the better reason and nothing else shall determine its outcome. In the courtroom, "the skills of the barrister, the rhetorical presence, the strategy used in selecting the jury, cross-examination skills, a superior information base, the advocate's shrewdness… may play a greater role in determining the outcome than the force of the advocate's reasoning." (153) Similarly, arguments in rhetorical contexts where the goal is effective persuasion are not part of a practice of argumentation, because the goal of effective persuasion can often be met better by ignoring objections (270).

I believe that Johnson is correct to distinguish the interventions of lawyers in a legal proceeding or of partisan participants in debate from the practice of argumentation to which he draws our attention. The difference is however not captured by his proposed definition. Opposing lawyers or candidates or spokespersons may quite easily construct and present arguments, interpret and criticize their opponents' arguments, and revise their arguments in response to criticism. But in such rhetorically driven exchanges competing participants aim to secure or intensify adherence of an audience to their favoured thesis, whereas participants in argumentation are (or are supposed to be) aiming at a rationally supported position on an issue. To distinguish practices whose participants are (and are recognized as being) rhetorically driven from those whose participants are (or are supposed to be) rationally driven, we must supplement Johnson's definition.

In doing so, we should aim to characterize the purpose of the participants in a genuine argumentation, rather than the function of the practice. The (at least pretended) purposes of participants in a communicative practice can fairly easily be established from their typical behaviour and from culturally accepted norms whose violation attracts disapproval. The function of the practice, on the other hand, is not always evident; its discovery requires investigation, and so (on pain of vicious circularity) it cannot be part of the definition which we use to determine whether a given communicative interaction is an instance of the practice. Admittedly, Johnson talks about "the fundamental purpose" of the practice of argumentation, and characterizes it variously as "to arrive at the truth about some issue" (158) and "rational persuasion" (159). Despite appearances, however, these characterizations describe the expected purpose of the participants rather than the function of the practice. That purpose might better be described as reaching a shared rationally supported position on some issue, because argumentation can be about what to do as well as about what is the case, and because argumentation focuses on the opinions of its participants, not on those of a non-participating audience (as trials, for example, and election campaigns do).

Further, to characterize the telos of argumentation as rational persuasion is to embrace a rhetorical conception of its function; rhetoric, in Aristotle's classic definition, is "an ability to observe in each case the possible means of persuasion". (1959, *Ars Rhetorica* I.2.1355b25-26) A rhetorical conception of the telos of argumentation makes it hard to argue for the obligation of an arguer to respond to

objections; from a rhetorical perspective, it may be perfectly rational to ignore certain objections. Even construing the goal as rational persuasion may not rule out appeals to ethos and pathos in the way that Johnson wishes to, since these can play an ancillary role without making persuasion irrational.

I therefore propose as the overall expected purpose of participants in the practice of argumentation that of arriving at a shared rationally supported position on an issue. The reference to rational support makes sense of the consideration of objections, openness to criticism and willingness to revise arguments which Johnson rightly cherishes as hallmarks of the practice. It explains how the goals which Johnson regards as internal to it (increase in rationality of the participants and being rationally persuaded or coming closer to an acceptable position [155]) in fact follow from its definition.

I would like also to propose a change of name. The word 'argumentation' is already in common use for what Johnson characterizes as the "illative core" of argument, the offering of reasons in support of a position. The "argumentation schemes" to which he refers are schemes for argumentation in this sense. Van Eemeren and Grootendorst (1984, 1992) characterize what they call 'argumentation' in this sense as a complex speech act; the "argumentation stage" of their four-stage normative model of an argumentative discussion is the stage in which arguments are presented. I propose therefore that we call the practice to which Johnson draws our attention argumentative discussion, the designation it receives in the title of van Eemeren and Grootendorst's (1984). Then our revised definition would read as follows:

> An argumentative discussion is a sociocultural activity of constructing, presenting, interpreting, criticizing, and revising arguments for the purpose of reaching a shared rationally supported position on some issue.

20.4 Apparent Counterexamples

This definition, it might be objected, attributes to participants in argumentative discussions a purity of intention which real-life participants in the six practices described earlier often do not possess. People who write letters to the editor, phone radio talk shows, send messages to Internet discussion groups and join in panel discussions are often more concerned to assert their own position than to engage in a back-and-forth interchange which might lead them to change their mind. Referees may push their own view rather than suggest ways of strengthening the argument in a manuscript. Scholars and scientists may cling stubbornly to a favoured view long after it has been decisively refuted. Similarly for judicial and quasi-judicial opinions, discussions among family and friends, and decision-focused discussions at meetings.

There are two possible responses to such apparent counterexamples. One is to weaken the definition of argumentative discussion so as to embrace the counterexamples; one might for example speak about the ostensible purpose of the

participants. Then one would develop norms for the good conduct of argumentative discussions; ego-involved or partisan participants would be said to be engaging in an argumentative discussion, but doing so in bad faith. The other response is to stick to the definition and deny that the apparent counterexamples are really counterexamples. Ego-involved or partisan contributors to a spoken or written exchange may pretend to be involved in an argumentative discussion, but they are really not discussing. They are debating. Thus the normative criteria for good argumentative discussion are built right into its definition. Any argumentative discussion is by definition a good argumentative discussion (according to the internal standards of the practice). There is no such thing as a bad argumentative discussion. If it is a bad form of communication according to the standards of the practice of argumentative discussion, then it is not really argumentative discussion, whatever the person engaged in the communication may say.

These two responses exemplify two possible strategies for making a concept precise. The descriptive strategy, exemplified by broadening the proposed definition of argumentative discussion, is to start with a broad descriptive characterization (e.g. of art, music, philosophy, critical thinking) and then develop evaluative criteria for distinguishing better instances from worse ones. (On the negative side, one would start with a broad descriptive characterization of a concept like suicide or murder or ad hominem attack, and then distinguish within the broad class covered by this characterization between justifiable and unjustifiable instances. The prescriptive strategy is to start with an honorific (or pejorative) characterization with the norms built in and use some qualified label for instances which fail to meet the norms. Is one of these strategies objectively more correct than the other? Are the fluorescent paintings on black velvet backgrounds which are sold in the parking lots of neighbourhood strip malls bad art or pseudo-art? Is a defence lawyer's exposure of the personal failings of a key witness an ad hominem attack justified by its relevance to impugning the credibility of the witness's testimony, or not an ad hominem attack at all, since the lawyer commits no fallacy? Is a grossly partisan participant in a panel discussion on some political question a bad discussant, or someone who is not really discussing at all? There seems to be no fact of the matter about the answers to these questions; it all depends on how one uses the key word in question. Both the descriptive and the prescriptive strategies have their point. A descriptive strategy makes it easier to identify cases which fall under the concept; one does not need to check for conformity to norms (positive or negative) in order to call something art, argumentative discussion, music, philosophy, critical thinking, suicide, murder, ad hominem attack, or whatever. On the other hand, extending the concept to cases outside the usual norms debases the honorific or condemnatory force in the ordinary usage of the term; if some murders are excusable, or even justifiable, how are we to preserve the outrage associated with calling something an act of murder? The prescriptive strategy preserves the normative force of our terminology, but at the price of making it a more complicated task to discover whether a term applies to a given case. Each strategy's strength is the other one's weakness.

The decision between the two strategies is not a mere matter of stipulation. The acceptability of Johnson's definition and of the norms incorporated in it depends on

the existence of a certain practice and the recognition within it of the norms in his definition. The practice of argumentative discussion does seem to exist, in our culture and in others; its participants seem to recognize as a norm the goal of arriving at a shared rationally supported position on an issue. So Johnson's definition is defensible, and the prescriptive strategy for dealing with apparent counterexamples is defensible.

20.5 Properties of Argumentative Discussion

The modified definition of argumentative discussion distinguishes it from similar but more rhetorically driven practices and thus makes possible the derivation of the characteristics Johnson attributes to argumentative discussions as a theory of argumentative discussion. Unlike mathematical proofs, the following derivations depend on implicit assumptions and involve non-conclusive inferences, whose conclusions are vulnerable to undermining or overriding defeaters. Thus these 'proofs' are subject to the sort of criticism and future revision which Johnson regards as central to an argumentative discussion.

In some cases, I have found it necessary to revise some of Johnson's 'theorems'. I note such revisions in the comment section following the 'proof'.

Theorem 1: A participant in argumentative discussion who makes a claim which requires rational support must support it with reasons.

Proof: If the participants are to arrive at a shared rationally supported position on the issue under discussion, then their acceptance of any claim as a basis for their shared position must be reasonable. A claim made by a participant in an argumentative discussion is a contribution to arriving at a shared rationally supported position. Hence either it is reasonable for the other participants to accept this claim without rational support or the maker of the claim must support it by reasons.

Comment: Johnson asserts that a participant in an argumentative discussion who makes any claim must support it with reasons. (158, 160, 162) This assertion is subject to an infinite regress, if we assume that each reason is itself a claim and thus needs to be supported by reasons. Johnson's remark that "participants in the practice [of argumentative discussion–DH] recognize that any claim made must be supported by reasons or evidence" (160) allows one way out of the regress–producing physical evidence, for example pointing to ominous dark clouds to the west in support of one's claim that it will be raining soon. But we ought to allow other ways; eye-witness testimony, expert opinion and shared reasonable assumptions, for example, generally do not require supporting reasons. Thus not every failure to support a claim with reasons means that conclusions drawn from that claim lack rational support. The qualification "which requires rational support" points up the need for a theory of rational support.

Theorem 2: Participants in an argumentative discussion may appeal to reasons (including physical evidence) and only to reasons (311).

Proof If one appeals to anything other than reasons or evidence in order to get a claim accepted (e.g. presenting oneself as a person of admirable character whose word is to be accepted just on one's say-so, using intimidating tactics, stirring up emotions in a way which is not justified by the substance of one's argument), then those who accept the claim on this basis will not have rational support for it. Thus the aim of reaching an agreed rationally supported position will be undermined.

Comment: 'Reasons' are taken to include evidence in order to accommodate Johnson's allowance of evidence as a rational starting-point for an argument.

Theorem 3: A participant may not resort to trickery or force to get a claim accepted (319).

Proof: A claim accepted even partly on the basis of trickery or force is not accepted because of rational support. Therefore, it and any conclusions drawn from it are not assured of being rationally supported.

Theorem 4: An argumentative discussion presupposes a background of controversy (or potential controversy) about the issue under discussion (160).

Proof: If there were not even potential controversy about the issue, then there would be no need to construct, present, interpret, criticize and revise arguments in order to arrive at an agreed rationally supported position on the issue. If some or all the participants already had a common rationally supported position on the issue, and any without such a position were merely perplexed, it would be enough for one person to state the position with its rational support. If all participants are perplexed, but an exploration of facts relevant to settling the issue has no potential to lead to objections and criticisms (because for example a rationally well supported algorithm applies), then argumentative discussion is inappropriate.

Comment: Johnson requires actual controversy about an issue as a presupposition of argumentative discussion. But argumentative discussion seems appropriate also in cases of perplexity where no controversy yet exists, but investigation will likely produce it–e.g. the case of identifying the cause of Acquired Immune Deficiency Syndrome (AIDS) when the syndrome was first identified, before anyone had opinions about its etiology.

Theorem 5: The author of an argument in an argumentative discussion has a responsibility to deal with known alternative positions and with known objections (165, 318).

Proof: Since the issue in an argumentative discussion is controversial or potentially controversial (theorem 4), the others whom the arguer wishes to convert to the arguer's position may know of alternative positions and objections, and the arguer will know that they may know them. To ignore them would be to fail to engage in the process of arriving at a shared rationally supported position (160). To the extent that the arguer does not consider a known alternative position or deal with a known objection, the conclusion is less fully rationally supported than it otherwise would be. If rational consideration of an ignored objection would require modification of the conclusion, for example, then the conclusion is not rationally supported. If there is a rational response to the ignored objection consistent with the conclusion, then the audience (and perhaps the arguer) is deprived of the additional

rational support derived from knowing that a known objection can be defused. Similarly for known alternative positions.

Theorem 6: The addressees of an argument in an argumentative discussion have a responsibility to provide criticism of that argument if they believe it warranted, and the arguer has a responsibility to welcome and deal with their criticisms. The arguer agrees to let feedback from the Other affect the product, to take criticism seriously; intervention of the Other is not just accepted, but is encouraged, so as to make the product better (158, 161).

Proof: If the criticism is in fact justified, then addressing it to the arguer increases the chance that the argument will be modified so as to be more rationally supported, and thus increases the chance that the ultimate outcome of the discussion will be an agreed rationally supported position. If the criticism is not justified, then addressing it to the arguer increases the chance that its weakness will be made evident to the author of the criticism, thus dispelling an unjustified mental reservation about the argument and so strengthening adherence to a rationally supported claim.

Comment: This feature of argumentative discussion makes puzzling Johnson's privileging of written over oral argumentative discussions. While it is true that written arguments are more stable–and thus more amenable to analysis, evaluation and criticism–oral discussions lend themselves much more easily to fluid exchanges of tentative formulations open to revision on the fly. Wohlrapp's work on retroflexive argumentation (Wohlrapp 1998) and Willard's work on argumentation as dissensus (Willard 1983, 1989) are good examples of theorizing forms of argumentative discussion which are much less stilted and fixed than written exchanges.

Theorem 7: Contributions to an argumentative discussion must not only be rational, but must be seen by the participants to be rational (144, 163, 317–318).

Proof: We assume that participants in an argumentative discussion aim not just to agree on a rationally supported position, but to agree on a position because they know it is rationally supported. Fulfillment of this goal requires that they recognize the rationality of each contribution. This requires that the contribution be made in such a way as to secure this recognition.

Comment: The requirement that contributions to an argumentative discussion be seen by its participants to be rational is the requirement of manifest rationality which gives Johnson's book its title.

Theorem 8: The outcome of an argumentative discussion is to be determined only by the strength of the better reason (153, 160).

Proof: If anything else even partially determines the outcome, then there is no assurance that the better reason actually favours the outcome reached and thus no assurance that it is rationally supported.

Theorem 9: Participants in an argumentative discussion must be rational, and must know that they are rational (162, 164 n. 15).

Proof: Construe rationality in terms of a disposition to support claims by reasons or evidence when they need such support, to acknowledge the force of reasons, and so forth. To be rational in this sense is a requirement of arriving through discussion at an agreed rationally supported position. If the participants are not just to agree on

a position which is in fact rationally supported, but are to recognize that it is rationally supported, then they must each have the rationality required to recognize rational support and they must recognize that each of them has it.

Theorem 10: The participants in an argumentative discussion embrace, endorse and cherish rationality (12, 14, 161, 162).

Proof: Rationality consists in giving and receiving reasons (14) or in using, giving or acting on reasons (161). Willing participants in a discussion which is devoted solely to giving, receiving, responding to and modifying reasons obviously cherish doing so.

Comment: Since a tricky argument nonetheless presents a reason supporting a position, and a threat is a reason for bowing to it, we need a further specification of rationality than "giving and receiving reasons" to rule out trickery and threats as non-rational or even irrational.

Theorem 11: An internal good of argumentative discussions is an increase in rationality among the participants and thus an increase in rationality in the world. Specifically, participants acquire a deeper understanding of the issue, or are rationally persuaded of a certain position on it, or come closer to an acceptable position (155, 162).

Proof: An arguer who sees and accepts a critic's objection has a more rational position on the issue addressed in the argument, whereas an arguer who shows that a critic's objection is wanting has a more rational position in virtue of having warded off objections. (162) The audience too, including the critic, has a more rational position as a result of either of these outcomes. The participants exhibit rationality by giving reasons, weighing objections, modifying positions to accommodate them; the arguer acknowledges the critic's objections, the critic acknowledges rationality in the arguer's position (162–163).

Comment: One might object that there are other possible sequences than argument, criticism, and acceptance or refutation of criticism. The arguer might just reject a critic's objection without having found it wanting. Or the arguer might accept an objection when there is a good reason for rejecting it. Or the potential critic might fail to bring forward a crucial objection, and instead accept the argument, thus reinforcing the arguer (and the critic) in an irrational commitment to the arguer's position. Or the discussion might degenerate into angry personally abusive recriminations. These outcomes however would transform the communicative interchange into something less than an argumentative discussion. It would have degenerated into egocentric dismissal of justified criticism, lazy acceptance of an interlocutor's statement without careful scrutiny, 'polite' acquiescence despite awareness of an objection, or appeal to something other than the strength of the reasons.

Theorem 12: Argumentative discussion depends on a specifically human form of rationality (12).

Proof: Other animals are not able to give and receive reasons (13).

Corollary: Only humans engage in argumentative discussion (162).

Theorem 13: Argumentative discussion is not the only rational process.

Proof: Proving and theorizing are distinct rational processes (162).

Comment: Though distinct from argumentative discussion, proving shares the characteristic of manifest rationality. The point of a proof is to show to an intended audience that a conclusion follows necessarily from given assumptions. Hence at each step the intended audience must be able to see how the conclusion is drawn. The proof must be seen to be rational.

Theorem 14: A culture has a practice of argumentative discussion only if its members have a common interest in inquiry, getting at the truth or persuasion (15, 16).

Proof: By definition, the practice requires its participants to aim to reach a shared rationally supported position on some issue. Hence the participants in an argumentative discussion must have a common interest in achieving this goal.

Comment: Not all members of a culture need share this interest, nor need they share it on all issues. It is enough if there are groups which communicate internally and share this interest on some issues. Johnson's apparent assumption to the contrary (16) seems overly strong.

Theorem 15: A culture has a practice of argumentative discussion only if its members seriously disagree about some important issues (as opposed for example to subscribing jointly to some mythopoetic standpoint) (15).

Proof: From theorem 4.

Theorem 16: A culture has a practice of argumentative discussion only if its members understand and value rationality as a means of achieving their common interest (15).

Proof: If members of a culture did not value rationality as a means of achieving their common interest in truth or persuasion, then they would not participate in and endorse a practice which requires its participants to appeal only to the force of the better reason in reaching agreement on a controversial issue.

Comment: This valuing of rationality need not be universal, either among the members of the culture or with respect to all issues.

Theorem 17: A culture has a practice of argumentative discussion only if its members are open to changing their view as a result of argument (15).

Proof: From theorem 6.

20.6 The Value and Present Status of Argumentative Discussion

Johnson believes that argumentative discussion is "an extremely powerful and valuable cultural practice" (11). It might not be amiss to say why. It is powerful because it has the potential, like few other practices, to change ignorance into knowledge and prejudice into reasoned judgment. The controversial issues which are the focus of argumentative discussion include issues about far-reaching questions of public policy. By changing opinion about those issues, argumentative discussion can thus have an immense impact on human lives.

This impact is generally an impact for good. Human well-being (and the well-being of animals, species, the biosphere and our planet) is served best by positions and policies which reason would support. While intuition or precedent or ideology might arrive at a correct position and a wise policy, such methods are chancy at best, dangerous at worst. (Where they are reliable, of course, reason will endorse them.) Partisan debate, although sharing some features of rationality with argumentative discussion, is strongly affected by non-rational or even irrational influences. Free and open rational discussion, welcoming criticism and willing to change in the light of that criticism, is the most secure route to correct views and wise policies.

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Chapter 21
Postscript

Abstract Reasoning and argument sometimes occur in back-and-forth argumentative discussions. The goal of participants in an argumentative discussion is to reach a shared rationally supported position on an issue. The discussion is a persuasion dialogue if it starts with a proponent advancing a thesis, but an inquiry or deliberation dialogues if it starts with a factual or policy issue. Other pure types of dialogue (information-seeking, negotiation, quarrel) are not argumentative discussions. Formal systems for conducting argumentative discussions are more constrained than real-life discussions, and are difficult to assess for soundness and completeness if they are realistic enough to allow for data-gathering and modification of theses. But their development has both theoretical and practical benefits. In particular, there may be a place for formal systems of inquiry dialogue where interlocutors arrive jointly at an answer to a question that none of them can reach individually.

21.1 Introduction

An important setting for reasoning and argument is back-and-forth discussion among people, and more recently with and among software agents. Some approaches to the study of argument, such as the pragma-dialectical approach of van Eemeren and Rob Grootendorst (1984, 1992, 2004) and the "new dialectic" of Walton (1990, 1998), want to construe all argument as if it were taking place in dialogues. Other scholars, such as Habermas (1984/1981), Johnson (2000) and Wohlrapp (2008, 2014), co-opt the vague word 'argumentation' to stand for an idealized practice of argumentative discussion, which they take as their primary object of study. Even those who take a rhetorical approach sometimes construe the audience to be persuaded as interactive with the arguer (Duranti 1986; Tindale 2015, p. 183).

In fact, for most of the 2000 years from Aristotle to the 17th century, 'dialectica' (Greek 'dialektikê') was the usual word for what today we call 'logic' (Scholz 1961/1931, pp. 8–9). The Hellenistic Stoics, for example, used the Greek term

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'*logikê*' ('logic') for one of the three main branches of philosophy—namely, the investigation of our engagement with discourse (Aetius, cited in Long and Sedley 1987, p. 158). They divided logic in this sense into *rhêtorikê* ('rhetoric'), construed as the science of speaking well with regard to continuous discourses, and *dialektikê* ('dialectic'), construed as the science of correct discussion with regard to discourses conducted by question and answer (Diogenes Laertius 7.42). This way of characterizing rhetoric and dialectic corresponded to the focus of their rhetorical tradition on public speaking and of their logical tradition on question-and-answer examination of theses. Aristotle (1984) already makes the same distinction when he begins his *Rhetoric* with the sentence, "Rhetoric is the counterpart of dialectic." (*Rhetoric* 1.1.1154a1) When Aristotle writes that the rhetorical deduction, which he calls an enthymeme (1356a4–5), "is a deduction from few premisses, often fewer than those from which the primary deduction <comes>" (1357a16–17, my translation), he means by the primary deduction the deduction in dialectical question and answer, where the questioner gets the answerer's assent to premisses from which to draw a conclusion that follows necessarily and formally. Dutilh Novaes (2012, pp. 154–55) cites research suggesting that deductive reasoning emerged in the practice of question-and-answer examination in ancient Greece as a way of compelling one's adversary to accept a desired conclusion, and is thus in its origin dialogical. The only logic textbook that has survived from antiquity, by the physician Galen (1964, p. 200), was called in Greek *Eisagôgê dialektikê*, i.e. "Introduction to dialectic", the standard title in antiquity of Greek introductory logic textbooks. In situating logic in conversation, Lorenzen and Lorenz (1978) and Barth and Krabbe (1982) are putting logic back where it started and, according to them, where it properly belongs; proof and justification, they say, is always proof or justification *to* someone.

One can concede that much argument, including arguments in single-authored texts, is dialectical in the sense of being part of a conversation. An argument in a text is often a response to previous writing or speech on the topic, and may prompt comments by others. The study of argument clearly must take these dialectical aspects into account, both descriptively and prescriptively. But it goes too far to shoe-horn all argument into a dialectical mould. Some arguments are just presented, without being a response to previous discussion or provoking a reaction. Further, even arguments that form part of an exchange may have their own integrity, deserving consideration on their merits apart from their dialectical setting. Further, arguments have important features in common with solo reasoning, such as their inferential structure and their components' epistemic status; solo reasoning, in which one works out for oneself what to believe or what to do, is not part of a conversation between people. Much of the writing assembled in the present collection has focused on such common features, and (as I have just argued) legitimately so.

The two papers in the part entitled "Interpersonal discussion" are exceptions to this general neglect of dialectical considerations.

21.2 "Some Principles of Rational Mutual Inquiry" (1991)

"Some principles of rational mutual inquiry", written in 1990, was a flawed attempt to extend the work of investigators in formal dialectics (Hamblin 1970; Lorenzen and Lorenz 1978; Barth and Krabbe 1982) to inquiry dialogues, in which the discussants try to work out together the answer to an open question on which none of them has a preliminary position. The inclusion of this chapter in the present collection provides an opportunity to reframe and update its content.

To begin with, the title is misleading. The chapter does not lay down principles that any rational mutual inquiry should follow. Rather, it proposes principles to which a set of rules for a formal dialogue game of mutual inquiry should conform. Such proposed principles as externalization and rule-consistency make sense only in this context. Other principles, such as orderliness and staging, would be too confining for many people engaged in mutual inquiry; it is not irrational, for example, for a person to combine in one turn a suggested explanation of some event with an account of how this hypothesis would explain much of what the inquirers know about the event, thus opening up in one turn several issues that the rest of the company could take up.

Second, the chapter should have distinguished inquiry dialogues from deliberation dialogues and from negotiations. The distinction between scientific inquiry and deliberation goes back to Aristotle (*Eudemian Ethics* 2.10.1227a7–10), and is worth preserving; inquiry concerns a factual question to which the answer is either true or false, whereas deliberation concerns a policy question to which the answer is either reasonable or unreasonable. The theoretical or epistemic reasoning involved in answering a factual question is sufficiently different from the practical reasoning involved in answering a policy question that discussions of the two types of questions should be modeled differently. The present chapter helped to inspire the framework for deliberation dialogue in (Hitchcock et al. 2002) and (McBurney et al. 2007), but despite obvious parallels the framework for deliberation dialogues has important differences that reflect the broader scope of practical reasoning.

Negotiation is another kind of dialogue altogether. Its purpose is neither to reach the correct answer to a factual question nor to reach a reasonable answer to a policy question, but to reach an agreement that satisfies optimally the interests of the negotiating parties. Principled negotiation of the sort proposed by Fisher and Ury (1983) may begin without a starting proposal from either side, but it differs from an inquiry dialogue in being an attempt to work out an agreement within agreed principles that satisfies declared interests of the parties. This specificity would give a formal dialogue game for principled negotiation special characteristics lacking in a formal dialogue game for inquiry or for deliberation. Positional negotiation, where the parties make a series of offers and counter-offers, is even more different in its structure from an inquiry or deliberation dialogue.

Of course, an inquiry dialogue can be nested inside another type of dialogue in a way that is functionally relevant. For example, in labour negotiations, the parties

Table 21.1 Main pure types of dialogue (Walton and Krabbe 1995, p. 66)

Type	Initial situation	Main goal
Persuasion	Conflicting points of view	Resolution of conflicts by verbal means
Negotiation	Conflict of interests and need for cooperation	Making a deal
Inquiry	General ignorance	Growth of knowledge and agreement
Deliberation	Need for action	Reach a decision
Information-seeking	Personal ignorance	Spreading knowledge and revealing positions
Eristics	Conflict and antagonism	Reaching an accommodation in a relationship

may inquire together on the annual cost to the employer of a proposed improvement in employee benefits.

Walton and Krabbe (1995, p. 66) have proposed a useful taxonomy of six main pure types of dialogues, distinguished by their initial situation and main goal, as set out in Table 21.1. They make the appropriate distinction between negotiation, inquiry and deliberation dialogues. They identify persuasion dialogue with what van Eemeren and Grootendorst (1984, 1992, 2004) call a "critical discussion". In the pragma-dialectical approach, the ideal model of a critical discussion is universally applicable to all argumentative discussion, and differences like that between negotiation and deliberation are taken to reflect external, culturally specific "argumentative activity types" (van Eemeren and Houtlosser 2005; van Eemeren 2010, pp. 129–162). Both approaches will work, but the Walton-Krabbe approach seems more natural.

A third weakness of "Some principles of rational mutual inquiry" is its exclusive focus on what Toulmin (1958) called "warrant-using arguments". The participants are to select a material inference-licensing rule that would enable them to infer an answer to the governing question of their discussion from data to be collected. For many factual questions, however, especially explanation-seeking questions, a less rigid approach makes sense. Investigators of a crime or an airplane crash need to start with an open-minded careful gathering of all the evidence and testimony relevant to their search for the perpetrator or the causal nexus. Human investigators need to guard against premature closure on a favoured explanation, which can lead them through our apparently hard-wired confirmation bias (Nickerson 1998) to ignore evidence that points to some alternative. There should be room along the way for an open-minded and free-wheeling generation of alternative hypotheses, but even tentative suggestions of this sort should not come too early, to avoid bias in subsequent investigation. A rule-governed system for inquiry dialogue among such investigators should incorporate such desiderata.

The proposed framework is too restrictive as well in requiring that the content of each turn open up at most one choice point for the speaker at the next turn. One can

preserve orderliness, in the sense of not leaving unaddressed loose ends, by allowing a move (i.e. the content of a turn) to address all the issues opened up at the immediately preceding turn. In the permissive persuasion dialogues of Walton and Krabbe (1995, p. 135), for example, each move consists of up to six components, each of which can have multiple contents: retractions, concessions, requests for retractions, requests for concessions, arguments, and challenges.

A fifth weakness of the proposed framework for mutual inquiry is its failure to allow for any adversarial component. At the very least, there needs to be acknowledgement of the possibility of motivated embedding of a persuasion dialogue in which one interlocutor can show to another that a certain answer to the governing question is implied by the other's commitments or conversely can cast doubt on the other's claim to that effect. Such a motivated shift between cooperative and competitive dialogues corresponds to the actual process of mutual inquiry, as we can see for example in the 17-year investigation by a community of experimental biochemistry researchers of how the cells of breathing animals use oxygen to generate energy (Weber 2004, Chap. 4).

A sixth possible weakness is the difficulty of proving soundness and completeness for any formal system conforming to the framework. Open-endedness at the start and provision for data-gathering and data-checking make a system realistic, but at the same time make it hard to generate any benchmark with respect to which one could explore the soundness or completeness of the system.

Despite its flaws, the framework for rule-governed inquiry dialogues may have fruitful suggestions for further development. There has been some work in artificial intelligence on formalizing inquiry dialogues. Black and Hunter (2009), for example, have modeled inquiry dialogues in which two agents pool personal beliefs in order to arrive at a result that neither could reach using their personal beliefs alone. They envisage a formal system with such dialogues as usable in a cooperative, safety-critical domain like medicine. They proved soundness and completeness of their system with respect to the benchmark of a single agent reasoning with the union of the two agents' beliefs. This work made no reference to the present chapter, but did reference (Hitchcock et al. 2002), which was partly inspired by it. There may be a place in the panoply of formal dialogue systems for cooperative rule-governed dialogue games whose human or software participants work together to answer factual questions that no single one of them could answer as easily, or at all, on their own.

In general, the study of formal dialectical systems can have both theoretical and practical benefits. Theoretically, it can provide a way to clarify dialectical concepts like proponent and opponent, as well as to explore the nature of various commonly recognized fallacies, especially those like begging the question (i.e. assuming what is to be proved), many questions, ad hominem, and straw man that necessarily occur in interpersonal discussion (van Eemeren et al. 2014, p. 306). Further, the dialectical approach to logic pioneered by Lorenzen and Lorenz (1978) is a distinctive contribution. "Some principles of mutual inquiry" maintained that their system is not particularly dialectical, since it just splits into two roles the rules of Beth's

semantic tableaux. This comment is unjust, since Lorenzen and Lorenz developed their work in ignorance of Beth's work.

For theoretical purposes, it may not be necessary to develop full systems of formal dialectic. Krabbe (2002) has developed the approach of using "profiles of dialogue" to discover formal rules for how dialogues should go and how fallacy criticisms can be made and responded to.

Practically, formal dialectical systems may form the underlying architecture for interactions among software and human agents. The "dialogue boxes" that pop up on our computer screens are a small example of such practical applications. The underlying software constrains what a user can enter in a way that may be at times frustrating but can also be productive.

21.3 "The Practice of Argumentative Discussion" (2002)

"The practice of argumentative discussion", published in 2002, is a revised version of a presentation in October 2000 at a symposium on Johnson's *Manifest Rationality* (2000). The chapter rationally reconstructs, with revisions, Johnson's theory of what he calls 'argumentation'.

In his reply, Johnson (2002, p. 313) expressed unwillingness to call the practice 'argumentative discussion' rather than 'argumentation'. As he notes (Johnson 2000, pp. 155–156), his use of the word 'argumentation' largely agrees with that of Habermas (1984/1981, p. 18). It is shared by Wohlrapp (2014/2008, p. 267). I find this use confusing. Post-war scholarship has used the word 'argumentation' either for a form of communicated reasoning contrasted to proof (Perelman and Olbrechts-Tyteca 1969/1958) or for a complex second-order speech act in which reasons are adduced in support of a point of view (van Eemeren and Grootendorst 1984, 1992, 2004; Bermejo-Luque 2011), To use the word with yet a third meaning, one not part of the rather vague ordinary usage of the term, is to multiply opportunities for confusion. In contrast, the phrase 'argumentative discussion', which occurs in the title of the initial presentation of the pragma-dialectical theory of argumentation (van Eemeren and Grootendorst 1984), indicates clearly what it refers to. In the rest of this section, I will use 'argumentative discussion' rather than 'argumentation' to refer to the practice that Johnson is theorizing.

Johnson (2002, p. 323) also rejected my proposal to change his definition of argument so as to make the goal of an arguer the addressees' acceptance of a thesis rather than recognition of its truth. Acceptance, he argued, is associated with a rhetorical approach to arguments but truth with his preferred logical approach. He acknowledged the need for an account of how prescriptive statements and value judgments could be said to be true, to accommodate types of theses to which we do not normally assign a truth-value. Johnson's resistance to my proposal has merit. One might quibble that acceptance is more a dialectical concept than a rhetorical one; a rhetorical perspective focuses on moving the hearts and minds of addressees, whereas acceptance is a communicative act that may be grudging and forced. But,

however categorized, acceptance need not reflect a logically meritorious argument. A better word than either 'true' or 'accepted' might be 'valid', which captures the merit that Johnson wants and applies just as naturally to normative claims as to factual ones. Habermas (1984/1981, p. 23) uses the word 'validity' as an umbrella term covering truth of propositions, efficacy of teleological actions, rightness of norms of action, adequacy of standards of value, sincerity of expressions, and comprehensibility or well-formedness of symbolic constructs. Wohlrapp (2014/2008, p. lix) uses the word 'valid' in a similar way in describing the goal of an argumentative discussion as determining whether a thesis is valid. In its ordinary usage, the word 'valid' means 'legitimate', as when one speaks about having a valid passport or a valid driver's license. Recognition of the validity of a thesis, in the sense of its legitimacy, seems to describe accurately what participants in an argumentative discussion are after.

Johnson (2002, p. 324) also objected to my removal from his definition of argument of a reference to the practice of argumentative discussion. He reiterated his claim that an adequate understanding of argument as a product requires situating it "within its proper context" (Johnson 2000, p. 154), the practice of argumentative discussion, and noted that he had explicitly replied (Johnson 2000, p. 173) to the charge of circularity in defining argument and argumentative discussion in terms of each other. In that reply, Johnson takes the practice of argumentative discussion to be prior in the order of intelligibility to the concept of argument. We can hardly discuss that practice, he writes, without mentioning arguments; mentioning them, however, does not commit one to any particular definition of argument. Thus Johnson invites us to accept a definition of the practice of argumentative discussion as a practice of interpersonal communication involving arguments (whatever they are) and then to accept his definition of an argument as a distillate of the practice of argumentative discussion that meets certain conditions. I find this reply unsatisfactory. If we are first to get clear on what the practice of argumentative discussion amounts to and only later acquire an understanding of what the arguments are that discussants construct, present, interpret, criticize and revise, how do we know what we are talking about when we define what an argumentative discussion is? In his characterization of argumentative discussion, Johnson is clearly using our ordinary understanding of the word 'argument' as the name of a premiss-conclusion complex. He might avoid circularity by starting with a highly general structural definition of 'argument' in abstraction from the purpose and context of the structurally defined complexes, then characterizing the practice of argumentative discussion in terms of this structural conception of an argument, and finally fleshing out the initial structural conception with the reference to its purpose and context provided by identification of argumentative discussion as the "proper context" of argument. In that case, premiss-conclusion complexes articulated in other contexts or for other purposes would be arguments in the broad initial structural sense but not in the narrow more honorific sense that includes the context of argumentative discussion and the purpose of persuading the addresses to recognize the validity of a thesis.

Habermas and Wohlrapp both manage to situate arguments within the practice of argumentative discussion without circularly defining each with reference to the

other. Habermas, in a passage that Johnson quotes (Johnson 2000, p. 156), characterizes argument without reference to argumentative discussion:

> We use the term *argumentation* [i.e. argumentative discussion—DH] for that type of speech in which participants thematize contested validity claims and attempt to vindicate or criticize them through arguments. An *argument* contains reasons or grounds that are connected in a systematic way with the *validity claim* of a problematic expression. (Habermas 1984/1981, p. 18; italics in original)

Habermas avoids a purely structural definition of argument by relating argument functionally to the validity claim of a thesis. He thus indirectly situates arguments within argumentative discussions, without defining the former in terms of the latter.

Wohlrapp (2014/2008) defines argumentative discussion as "the activity of examining and satisfying validity claims" (p. 267) and an argument as "any smaller or bigger part of argumentation [i.e. argumentative discussion—DH] that has an identifiable function in demonstrating the validity or non-validity of the thesis [whose validity claim is at issue—DH]" (p. 134). Thus he defines arguments with reference to argumentative discussions, but not vice versa.

The definitions of Habermas and Wohlrapp imply that arguments include not only attempts to justify theses but also criticisms, objections, refutations of objections, and so on. Habermas requires them to contain reasons or grounds, thus preserving the premiss-conclusion structure taken since antiquity to be characteristic of arguments. Wohlrapp does not. Thus his conception of argument is highly revisionary, perhaps too much so to find acceptance.

Johnson (2002, p. 324) deems it "unfortunate" that my reconstruction did not include the properties of being teleological, dialectical and manifestly rational that he takes (Johnson 2000, pp. 159–164) to be characteristic of argumentative discussion. Actually, the properties of being dialectical and manifestly rational are theorems 6 and 7 of my reconstruction (Hitchcock et al. 2002, pp. 295–296; p. 333 of the present volume), although the words 'dialectical' and 'manifestly' regrettably do not appear in the statement of those theorems. The teleological character of argumentative discussion is not a derived property to be mentioned in a theorem but a component of its definition, which my reconstruction discussed at length, although regrettably not using and referencing Johnson's word 'teleological'. I argued (Hitchcock et al. 2002, pp. 290–291; p. 328–329 of the present volume) that we should characterize the purpose of argumentative discussion by the participants' goal that is constitutive of it rather than by its social function that is a matter for empirical investigation; and that the participants' goal is not rational persuasion but reaching a shared rationally supported position on an issue. Johnson does not comment on the latter proposal. He should be amenable to it, since he writes that "the fundamental purpose [of argumentative discussion—DH] … is to arrive at the truth about some issue" (Johnson 2000, p. 158).

The reader may wonder what I would say in my own name about the practice of argumentative discussion. There is indeed such a practice, as shown by its six species described in my 2002 publication. It has internal norms, as is shown by

standard criticisms by one participant or another for departing from this or that requirement. But, in contrast to its characterization by Habermas (1984/1981), Johnson (2000) and Wohlrapp (2008, 2014), I would define it in terms of discussion of issues rather than examination of theses. And I would take the goal of a particular argumentative discussion to be that of arriving at a rationally supported position on an issue or related set of issues. Theses can be proposed in argumentative discussions, but even prior to the formulation of a thesis is the formulation of the issue on which it is a position. Discussions about the framing of the issue or issues at hand can take place before any discussant takes a position, and a theory of argumentative discussion should address this component. In contrast to Johnson (2000), and following Wohlrapp (2014/2008), I would take the goal of participants in an argumentative discussion to be establishing that a thesis is valid (i.e. legitimate or rationally supported) rather than a proponent's persuading opponents (Johnson's "Others") of the merits of some thesis. To ask that the Others be persuaded is to ask too much; the demand for heartfelt agreement is both empirically difficult to satisfy and normatively irrelevant. As to the concept of argument, I would define an argument in the traditional way as a premiss-conclusion complex and allow that it can be used for various purposes in various contexts, without privileging any specific purpose or context. Such a definition can be found in Chap. 32 (pp. 520–531) of the present volume. In the context of argumentative discussion, such premiss-conclusion complexes are used not only to argue for theses but also to raise objections and criticisms and to refute them. But Wohlrapp goes too far in treating as an argument any component of an argumentative discussion that is functionally related to demonstrating a validity claim. If such a component does not have a premiss-conclusion structure, it is quixotic to call it an argument. A discussant's stipulation of how they are going to use a certain term may be functionally related to demonstrating a validity claim, but it would baffle interlocutors to call this stipulation an argument. Thus in my view argumentative discussions contain more arguments than Johnson's definition admits but fewer than Wohlrapp's definition does.

How does this conception of argumentative discussion relate to the types of dialogue distinguished by Walton and Krabbe (1995)? Persuasion dialogues, inquiry dialogues and deliberation dialogues are species of argumentative discussion, distinguished by whether they begin with a thesis to be defended or an open question to be answered and by whether the open question is factual or prescriptive. Systems of formal dialectic restrict substantially the moves available to interlocutors and generally lack the dynamism of real-life argumentative discussion. It is a challenge to test for soundness and completeness formal systems that allow participants to reframe issues or modify theses in response to criticism. The other three types of pure dialogues distinguished by Walton and Krabbe (negotiations, information-seeking dialogues, quarrels) are not argumentative discussions, because their participants do not take as the aim of their discussion to arrive at a rationally supported position on an issue.

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Part V
Evaluation of Reasoning

Chapter 22
Relevance

Abstract Relevance is a triadic relation between an item, an outcome or goal, and a situation. Causal relevance consists in an item's ability to help produce an outcome in a situation. Epistemic relevance, a distinct concept, consists in the ability of a piece of information (or a speech act communicating or requesting a piece of information) to help achieve an epistemic goal in a situation. It has this ability when it can be ineliminably combined with other at least potentially accurate information to achieve the goal. The relevance of a conversational contribution, premiss relevance and conclusion relevance are species of epistemic relevance thus defined. The conception of premiss relevance which results provides a basis for determining when the various 'arguments ad' called fallacies of relevance are indeed irrelevant. In particular, an *ad verecundiam* appeal is irrelevant if the authority cited lacks expertise in a cognitive domain to which the conclusion belongs, the authority does not exercise its expertise in coming to endorse the conclusion, or the conclusion does not belong to a cognitive domain; otherwise the *ad verecundiam* is relevant.

The present chapter offers an analysis of the concept of relevance in general[1] and of epistemic relevance in particular. It applies this analysis to the supposed fallacies of

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[1]By relevance in general, I mean relevance in general. Thus the approach of the present paper is broader even than that called for by van Eemeren and Grootendorst (1990), who propose a unified framework for providing an account of the relevance of oral or written text fragments to their authors' communicative and interactional intentions. The present paper does not restrict the subject term of the relevance relation to text fragments.

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relevance which contemporary handbooks of argumentation, following Locke (1974/1690), designate as the *argumentum ad verecundiam*, *ad ignorantiam*, ad hominem, and so forth.

22.1 Relevance in General

22.1.1 Its Ontological Status

Relevance is a relation, not a property. Something is not relevant (or irrelevant) in itself, but is relevant (or irrelevant) to something. Thus one and the same thing can at the same time be both relevant and irrelevant, relevant to one thing but irrelevant to another. For example, the size of the population from which a sample has been (quasi-randomly) selected is irrelevant to the calculation of the margin of error in the sample results, but relevant to determining whether sampling without replacement introduces substantial bias into the selection method. And student demands in the 1960s for 'relevant courses' were indeterminate, since they did not specify what the courses should be relevant to.

Relevance can be a triadic rather than a dyadic relation, namely, where the relevance of one thing to another depends on the situation.[2] The first term of this triadic relation is the item which is relevant, the second term the item to which it is relevant, and the third term the situation in which the first item is relevant to the second. For example, whether the moon is shining (first term) is relevant to deciding whether to take a flashlight (second term) if I am going for a walk after sunset along a route not illuminated by artificial light (third term), but otherwise irrelevant. To accommodate such cases, we should treat relevance generally as a triadic relation, whose third term is the situation in which the first term is relevant to the second term, and acknowledge that there will be values of the first two terms for which the value of the third term makes no difference to whether the first is relevant to the second. For example, the fact that ice cream was invented in Italy is irrelevant to proving the Pythagorean theorem, regardless of the situation in which someone is attempting the proof.

[2]By "situation" I mean the complex of antecedent and contemporary circumstances in which the item which is relevant or irrelevant and the item to which it is relevant or irrelevant occur. I prefer "situation" to the roughly equivalent word "context", because the latter word's etymological connection to texts might suggest a more restrictive conception of relevance than the one I analyze in this paper. Naturally, not all antecedent and contemporary circumstances make a difference to whether one item is relevant to another; in practice, therefore, one will specify a situation by mentioning only its features which do make a difference to the relevance relation between the items under discussion.

22.1.2 Its Relation to Irrelevance

Within the class of triples for which relevance is defined, relevance and irrelevance are contradictory relations. That is, for given items x and y and situation z, x is relevant to y in z if and only if x is not irrelevant to y in z. In other words, x is either relevant or irrelevant to y in z, but not both. There is no third possibility, and there is no triple ⟨x, y, z⟩ for which z is a situation and x is both relevant and irrelevant to y in z.[3] A situation may however be so vaguely described that its description leaves indeterminate whether one thing is relevant to another in that situation. In the ninth inning of a baseball game, is the fact that the tying run is at the plate relevant to deciding whether to replace the pitcher? It is relevant if the pitcher is faltering, but irrelevant if it is a fresh new pitcher who has just thrown two strikes at the batter. Another way of putting this point is that, although in a particular situation z a given item x is relevant or irrelevant to a given item y but not both, in a type of situation Z a given item x may be sometimes relevant and sometimes irrelevant to a given item y, depending on other factors. The third member of the triple should therefore be an actual situation, not a type of situation, unless the first member is either always or never relevant to the second one in that type of situation.

22.1.3 Is Relevance a Matter of Degree?

It is debatable whether relevance is a matter of degree.

On the one hand, we speak quite freely of information as being highly relevant, somewhat relevant or only slightly relevant to an issue under discussion. Perhaps we even say that one piece of information is more or less relevant to an issue than another piece of information; that a relief pitcher gave up a run last week after walking two batters may be said to be more relevant to deciding whether to take him out of the game now that he has walked two batters than that he did the same thing a year ago.[4]

On the other hand, it is tempting to argue that relevance is not a matter of degree, on the ground that irrelevance, its contradictory, is not a matter of degree: one thing is never more irrelevant than another to something. The fact that ice cream was invented in Italy is irrelevant to proving the Pythagorean theorem, and so is the fact that water freezes at zero degrees Celsius. Neither fact is more or less irrelevant than the other. Each is equally irrelevant, or, better, simply irrelevant. Likewise, it seems, a relevant piece of information must be simply relevant, not more or less relevant.

[3]For triples ⟨x, y, z⟩ over which relevance is undefined, x is neither relevant nor irrelevant to y in z.

[4]This suggestion comes from John Woods. I hesitate to endorse it because my linguistic intuitions on the point are uncertain and I have not noticed any real-life comparative judgments of this kind in several months of attunement to everyday uses of “relevant” and “irrelevant”.

One way to resolve this tension is to interpret talk about information being more or less relevant to an issue as confounding a judgment that information is relevant with a judgment about how much the information contributes to resolving the issue. For clarity, we might do better to follow the legal practice of distinguishing whether something is relevant from whether it is material (and how material it is). It would then be a misnomer to speak of one thing as being more or less relevant than another; rather, we should speak of one thing as being more or less significant, important, substantial, or weighty than the other. In the case of arguments, such differences would be differences in degree of support, not in degree of relevance; the premiss that someone feels much better offers more support to the conclusion that he can start working again than the premiss that he feels a little better, but both are relevant.

Another way to resolve the tension would be to reject the inference that contradictories of relations that do not come in degrees also do not come in degrees. Uselessness and unhelpfulness, for example, are not matters of degree, but one thing may be more useful or more helpful than another.

22.1.4 Two Main Types: Causal and Epistemic

Broadly speaking, we use the terms 'relevance' and 'irrelevance' in two senses. These senses are often confused; it is important to distinguish them.

One sense is causal: something is relevant to an outcome in a given situation if it helps to cause that outcome in the situation, irrelevant if it is of no help. Thus, a book of medical advice states that "salt change [in the diet–DH] is probably irrelevant" (Cutler 1990, p. 213) to reducing blood pressure for people with normal salt metabolism. And the author of a book on the birth of the Solidarity movement in Poland in 1980 writes that "intellectuals had not been a relevant factor in the tense period between the first surfacing of the strike on August 14 and the government's decision eight days later to experiment with the negotiating process" (Goodwyn 1990).

The other sense is epistemic or justificatory. When a lawyer in a trial objects that another lawyer's question is irrelevant, she is not claiming that the answer to the question will be of no help in causing a settlement of the question at issue. Indeed, the lawyer is most likely to raise such an objection when the answer to the question will help to cause a settlement of the question at issue, namely, by prejudicing the mind of the judge or jury against her client. Rather than objecting that the answer to the question is causally nugatory, the lawyer is claiming that it is of no logical or justificatory help in settling the question at issue. In a trial for sexual assault, Canadian law used to stipulate[5] that questions about the past sexual behaviour of

[5]A recent decision of the Supreme Court of Canada introduced qualifications into legislation banning completely the introduction of such evidence.

the complainant are irrelevant, not because the answers to such questions are of no effect in leading judges and jurors to a decision on whether the accused is guilty, but because it was thought that they ought not to have an effect; women who have consented to sexual relations in the past have a right not to be forced to engage in sexual relations, and it is too easy for defence lawyers to use such previous consent to blacken the character of the complainant. I propose to use the term 'epistemically relevant' for this sense of relevance, although I have in mind not only cases where the goal is knowledge in a strict sense but also cases where it is reasonable belief or reasonable behaviour.

One can create the appearance of reducing the justificatory sense of relevance to the causal sense. For example, one can say that something is epistemically relevant if and only if it should be causally relevant.[6] And one can say that something should be causally relevant if and only if it would be causally relevant to a judge whose mental apparatus was functioning well. But this reduction is only apparent, for there is no independent way of identifying judges whose mental apparatus is functioning well (in the relevant respects). One must articulate the criteria that they use in putting together pieces of information to arrive at a desired result. And these criteria are precisely the criteria in terms of which one is to decide whether a piece of information is epistemically relevant.[7]

Causal relevance and epistemic relevance are related notions. They have in common that the relevant item makes some contribution, is of some help.[8] They differ in that a causally relevant item makes a causal contribution, whereas an epistemically relevant item makes a contribution to an epistemic goal, a contribution which may or may not have an effect in the mind of the person or persons pursuing that goal. In Sir Arthur Conan Doyle's story 'Silver Blaze', for example, the fact that the watchdog in the stable did not bark during the night is epistemically relevant to the goal of discovering who stole the horse. But this information has no

[6]Blair (1989) offers such an analysis in terms of the epistemic goal of justifying acceptance of the conclusion of an argument. If a premiss is positively relevant to a conclusion, he writes, accepting it either alone or in conjunction with other accepted propositions should cause one to be more inclined to accept the conclusion. In his (1992), Blair retracts this point on the ground that causing a person to accept the conclusion is neither necessary nor sufficient for the relevance of a premiss. But this point is no objection to an account of relevance in terms of what *should* cause a person to accept a conclusion. The difficulty is rather that the account is not fundamental, in that one must explain when a premiss should cause a person to accept a conclusion in terms of criteria for justifying acceptance. Once these criteria are specified, the concept of relevance can be explained directly in terms of them, without any mention of causing acceptance.

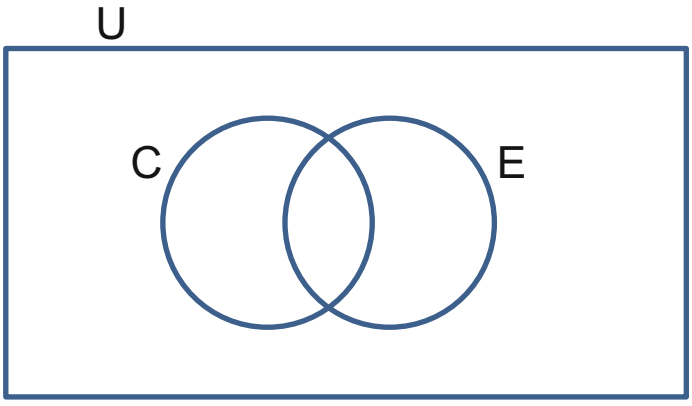
[7]John Woods (1992) shows in detail why Sperber and Wilson's attempt (1986) to use a descriptive account of subjective relevance conceived as a causal relation as the basis for a normative account of objective relevance fails.

[8]The fact that relevance is a kind of helpfulness supports the view that it is a matter of degree. Helpfulness is a matter of degree, even though unhelpfulness is not.

effect on the mind of the inspector investigating the crime until Sherlock Holmes points out its relevance.

Epistemically relevant items can help those who notice their relevance to achieve their epistemic goals, as they helped Sherlock Holmes in Sir Arthur Conan Doyle's story. In this sense an epistemically relevant item can also be causally relevant. But this sort of causal relevance of items to epistemic goals is always mediated by a judgment of relevance, usually implicit; epistemically relevant items are not causally relevant for people who do not notice their epistemic relevance. Thus epistemic relevance is distinct from causal relevance.

Despite the distinctness in meaning, the extensions of causal relevance and epistemic relevance overlap. The fact that the dog did not bark in the night is both causally and epistemically relevant to Holmes' discovering who stole the horse. There are also triads among which epistemic relevance obtains but not causal relevance: the same fact, for example, is epistemically but not causally relevant to the police inspector's discovering who stole the horse. And there are triads among which causal relevance obtains but not epistemic relevance. In the 1945 general election in Britain, it is said, the fact that Churchill took a long time building a brick wall in his garden during the war helped Labour to defeat him; this piece of information was therefore causally relevant to some voters' decision as to which party to vote for, though not epistemically relevant. We could represent the partial overlap of the two concepts in the Euler diagram in Fig. 22.1.



U = {<x, y, z>: x is an item, y an outcome or goal, z a situation}
C = {<x, y, z>: x is causally relevant to y in z}
E = {<x, y, z>: x is epistemically relevant to y in z}

Fig. 22.1 Overlap of causal relevance (C) and epistemic relevance (E)

22.1.5 Subjective Relevance

The perceived or attributed epistemic relevance of a piece of information may be called subjective relevance.[9] Since such subjective relevance consists in a judgment or claim (explicit or implicit) that a given piece of information is epistemically relevant, and epistemic relevance is objective relevance in the sense that it holds whether or not the person with the epistemic goal in question recognizes that it does, objective relevance is prior to subjective relevance.[10]

The phrase 'irrelevant for X' means 'regarded by X as (epistemically) irrelevant'. Consider the remark that "school rules are pretty irrelevant for someone who's worth more than practically everybody else put together" (quoted in the *Manchester Guardian Weekly*, Vol. 45, No. 4 (July 28, 1991), p. 4). This means that such a person regards these rules as largely irrelevant, in the sense that they have little role to play in his working out what to do.

22.2 Epistemic Relevance

22.2.1 Ontological Status of Its Terms

In what follows I shall restrict my attention to epistemic relevance.

The subject term of a relation of epistemic relevance is a piece of information, which may be characterized either as a proposition or as the value of a propositional function, or as a speech act communicating or requesting information (References in what follows to pieces of information as subject terms of relations of epistemic relevance should be taken to include speech acts conveying or requesting information). In the Silver Blaze case, for example, the relevant piece of information can be characterized either as the fact that the dog did not bark in the night (a proposition) or as whether or not the dog barked in the night (a propositional function). To take another example, in deciding whether to quit smoking, the price of a pack of cigarettes is relevant; here the relevant information is characterized as a propositional function, but one could also characterize it as the fact that a pack of 25 cigarettes costs over $5 in Ontario. For items other than pieces of information, we leave the relation of relevance undefined; it simply makes no sense to ask whether Dr. Watson (or London, or 1890) is relevant to determining who stole Silver Blaze.

[9]What Jacobs and Jackson (1992) call 'pragmatic relevance' appears to correspond to attributed relevance. What they call 'information relevance' appears to be a species of epistemic relevance, namely, premiss relevance, defined later in the present paper. The present paper agrees with their position that a conversational partner may not attribute relevance to relevant information, and may attribute relevance to irrelevant information.

[10]The approach of this paper can thus be contrasted to that of Sperber and Wilson (1986), who define relevance in a context as having an effect in that context.

The relatum of a relevant piece of information is an epistemic goal: an issue to be settled, a question to be answered, a problem to be solved, a decision to be made. What makes the information's relation to this goal epistemic rather than causal is that its recipient can combine it ineliminably with other information in a thought process to arrive at the goal. In most situations, for example, if one person asks another, "What time is it?", and the second person then says to the first, "I won $50 at the race track yesterday", the second person has given an answer which is (epistemically) irrelevant to the question, even if it causes the first person to remember that he is wearing a watch he won at a poker game the night before and to discover the time by looking at his watch. Although the answer was causally relevant in the sense that it was a component of a causal process which led to a given outcome,[11] it was not epistemically relevant, in that in the situation we are imagining the hearer could not combine it ineliminably with other information in a thought process to arrive at the outcome. The information obtained by looking at the watch was sufficient to tell the questioner what time it was, even without the information about the answerer's success in betting on the horses.

An epistemic goal, like any goal, is always the goal of a particular individual or group of individuals on a particular occasion. We might therefore be tempted to make the person or persons who have this goal into a fourth term of the relevance relation; on this analysis, an item of information x would be epistemically relevant to an epistemic goal y pursued by a set S of persons in a situation z. But mere difference of persons is irrelevant to the presence or absence of a relevance relation. If x is relevant to y for S in z, but irrelevant to y for T in z, there must be differences between the sets S and T of persons in virtue of which x is relevant for one set but irrelevant for the other, and these differences are best captured in the description of the situation. Arcane technical data from a physics experiment, for example, may be relevant to proving that a certain alloy is superconductive at relatively high temperatures to an audience of physicists who can deduce this conclusion from these data by combining them with their background knowledge, but irrelevant to proving the same conclusion to an audience of laypersons who cannot acquire the necessary background knowledge. We can accommodate such a case within an analysis of relevance as a triadic relation by counting the ability (or inability) of the audience to access specified background knowledge as part of the situation; the information will be relevant to the proof in a situation where the audience can access certain background knowledge, but irrelevant otherwise. Thus there is no need to add a fourth term of the relevance relation.

[11]Someone might object that the second person's remark is so remote from the first person's discovering what time it is that it is not a causal factor in the discovery. Although this objection would make it unnecessary to explain why the example is nevertheless not a case of epistemic relevance, we cannot rule out similar cases where an item of information would be causally but not epistemically relevant. Hence we need some explanation of why they would not be cases of epistemic relevance.

22.2.2 Reflexivity, Symmetry, Transitivity

Strictly speaking, since epistemic relevance is a relation of items of information to epistemic goals in situations, and no item of information is an epistemic goal, epistemic relevance is an irreflexive, asymmetric and vacuously transitive relation. That is, an item of information x is not relevant to itself, simply because it makes no sense to say that something is relevant to an item of information (The term 'relevance' is used from now on to mean exclusively epistemic relevance). Likewise, if x is relevant to y in a situation z, then y is not relevant to x, because it makes no sense to say that an epistemic goal y is relevant to a piece of information x. And if x is relevant to y in situation z, then y cannot be relevant to any epistemic goal w, because strictly speaking an epistemic goal is not the sort of thing that can be relevant to an epistemic goal;[12] hence there is no situation in which x is relevant to y and y relevant to w, but x not relevant to w.

Loosely speaking, however, we may elliptically characterize the subject and object terms of the relation of epistemic relevance as belonging to the same category. Whether the dog barked in the night, for example, is relevant, strictly speaking, to discovering who stole the horse; loosely speaking, we can say that it is relevant to who stole the horse. Whether the loosely characterized relevance relation is reflexive depends on what the unstated epistemic goal is; for example, who stole the horse is relevant to discovering who stole the horse (since anyone who is told correctly who stole the horse has discovered who stole the horse) but not to proving who stole the horse (since using this piece of information as a premiss in a proof is question-begging). The loosely characterized relevance relation is non-symmetric regardless of the unstated epistemic goal, since for any goal there are situations where items of information are relevant to each other (e.g. in Euclidean plane geometry whether two angles of a triangle are equal is relevant to whether the sides opposite these angles are equal and vice versa) and situations where one item of information is relevant to another but not vice versa (e.g. when one is going for a walk whether it is snowing is relevant to whether one should wear a coat but not vice versa). And the loosely characterized relevance relation is transitive; in a given situation, if x is relevant to y and y is relevant to w, then x is relevant to w, since x can form part of a complex process of arriving at y and using y to arrive at w.

22.2.3 Definition

An item of information x is relevant to an epistemic goal y in a given situation if and only if in that situation x can be put together with other pieces of at least

[12]If we say that working out when the next bus will come by is relevant to deciding when to leave the house, we mean that the information gained by working it out is epistemically relevant to making the decision.

potentially accurate information to arrive at the epistemic goal, provided that the other pieces of information are not sufficient by themselves to achieve the epistemic goal if the original information is inaccurate.[13] For example, the relevance of the fact that the dog did not bark in the night to the discovery of who stole the horse in 'Silver Blaze' consists in its implying, in conjunction with the facts that the dog barks at strangers and that the horse's trainer was the only non-stranger who was awake in the night, that the trainer stole the horse.

The proviso that the other pieces of information are not sufficient by themselves to achieve the epistemic goal if the original information is inaccurate is crucial. Without it any piece of information becomes relevant to any achievable epistemic goal,[14] since the piece of information can be put together with other pieces of information which are by themselves sufficient to achieve the goal and the whole set will still be sufficient to achieve the goal. For example, the diameter of the moon would be relevant to who stole the horse, since it implies, in conjunction with the information previously mentioned, that the trainer stole the horse (If p implies c, then p and q jointly imply c).

The condition that the other information be at least potentially accurate is also crucial, for the same reason. Any item of information p can be put together with the proposition that if p then c to achieve the epistemic goal of proving any proposition c, and 'if p then c' is insufficient by itself to prove c, if p is false.[15] But not every item of information is relevant to an arbitrarily chosen proposition.

One could avoid making every proposition relevant to every other by requiring that the other information be actually rather than merely potentially accurate.[16] But a single positive instance of a generalization is relevant even if it later turns out that other instances are negative; only at that point does the positive instance become irrelevant. And an initial positive result from a well-designed test of a hypothesis is

[13]This account captures what Blair (1989) and Woods (1992) call 'positive relevance', where the item of information makes a positive contribution to achieving the epistemic goal. It is desirable to distinguish negative relevance, making a contribution to the non-achievement of the epistemic goal, from irrelevance, making no contribution one way or the other. Such negative relevance could be defined analogously to positive relevance as making a contribution to achieving the opposite epistemic goal (being justified in accepting not p rather than being justified in accepting p). The concept of negative relevance can be defined only for epistemic goals which specify the proposition to which one is to achieve an epistemic relation. An item of information cannot be negatively relevant to open-ended epistemic goals like discovering who stole the horse or knowing whether it is possible to trisect a given angle with ruler and compasses.

[14]Here I appeal to one of John Woods' conditions in his (1992) for an acceptable account of relevance: that it must not make everything relevant to everything.

[15]The condition that the original information is false is intended to guarantee that this piece of information is not still being implicitly used in arriving at the epistemic goal. On the conception of consequence described later in this paper, c can follow just from 'if p then c', namely, in cases where p is true. But in this case the correctness of the rule of inference (from 'if p then q' you may infer q) is equivalent to the truth of p. ([(p → q) → q] is equivalent to p).

[16]Thus Blair (1989) requires that the other propositions be accepted.

relevant to confirming that hypothesis, even if it later turns out that other results are negative.

The condition of at least potential accuracy is formulated alethically, in terms of the truth-value of the other propositions. But it could be formulated epistemically (for example, in terms of warranted acceptability) or dialectically (for example, in terms of belonging to the commitment-store of the interlocutor).[17] Nothing hinges on which formulation is chosen.

Combination with other information is not essential. A piece of information which is sufficient by itself to achieve an epistemic goal is obviously relevant to achieving that goal.

22.2.4 In Conversation

In a conversation the question of relevance can arise only if there is a shared goal. At a stage where the interlocutors share a goal, a speech act is relevant to that goal if and only if it communicates (or requests) information which can be put together with other at least potentially accurate pieces of information to achieve the goal, provided that those other pieces of information are not by themselves sufficient to achieve the goal if the original item is false. If two people begin to discuss what subject one of them should major in, a remark by the other one that he met somebody the other day who majored in anthropology and arranged to play racquetball with him is irrelevant, because the information it communicates cannot ineliminably be put together with other pieces of information to justify a decision on a major.[18]

The relevance or irrelevance of a question is derivative from the relevance or irrelevance of a direct answer to the question. In one of Chesterton's detective stories (1987, p. 110), for example, the remark that "the question seemed irrelevant" means that a direct answer to the question would seem to contribute nothing to the current conversational goal–determining what had caused a dreadful cry at daybreak.

In an argumentative discussion, where one person is trying to convince another of a certain point of view, a remark by the proponent is relevant if and only if it communicates information which can help to justify that point of view. A remark by the opponent is relevant if and only if it helps to support or question the acceptability or relevance of information provided by the proponent. In legal proceedings questions are relevant if and only if a direct answer to them would be relevant in the senses just defined. Rules for rational discussion of the kind provided

[17]For the distinction, see Hamblin (1970). Although one may combine epistemic and dialectical considerations, they are distinct. An epistemically justified proposition, for example, need not be actually accepted by an interlocutor, and vice versa.

[18]The example comes from van Eemeren and Grootendorst (1990), who take it from Tracy (1982).

by van Eemeren and Grootendorst (1984) and Barth and Krabbe (1982) codify such a conception of irrelevance by ruling out gross irrelevancies. But not all violations of such rules are irrelevancies. Making a threat in the opening stage, for example, violates van Eemeren's and Grootendorst's rules, but we would be unlikely to call such a speech act irrelevant to the goals of the conversation; rather, it is subversive of them. Likewise, refusing to concede defeat in the concluding stage after being refuted at the argumentation stage is a violation of the rules, but it would be odd to call such behaviour irrelevant.

22.2.5 *In Argument: Conclusion Relevance*

In argumentative discourse generally, whether in monological texts or back-and-forth discussion, irrelevance can be of two kinds. An argument to a conclusion other than the one which is supposed to be argued for is said to be (Walton 1982) an argument to an irrelevant conclusion. Typical examples of such *ignorationes elenchi*, however, argue for conclusions which are in fact relevant to the question at issue but are not combined with other information to arrive at the desired conclusion. A prosecuting attorney who dwells at length on the brutality of the crime of which the defendant is accused has gone part way to proving that the defendant deserves punishment, but if he stops with the conclusion that a brutal crime has been committed whose perpetrator deserves severe punishment he has not gone all the way. His conclusion is not so much irrelevant as insufficient. Genuine cases of irrelevant conclusion are probably rare.

22.2.6 *Premiss Relevance*

The other type of irrelevance is an irrelevant premiss. A premiss is a statement presented as helping to support a conclusion. It is irrelevant if it does not in fact help to support it, that is, if it cannot ineliminably be put together with other at least potentially accurate information to produce a set of premisses which is sufficient to justify the conclusion. Otherwise it is relevant.

It is neither necessary nor sufficient for a premiss to be relevant to a conclusion that the conclusion follow from the premiss.[19] It is not necessary, because a premiss is relevant if the conclusion follows from it in conjunction with other at least potentially accurate information (but not from that other information when the premiss is false), even if the conclusion does not follow from that premiss alone; for

[19]This claim is a generalization of Blair's (1989) similar point for deductive entailment, which he justifies with similar reasons. The claim made in the present paper holds for all kinds of consequence, even weak kinds in which a conclusion follows from premisses in virtue of a merely probabilistic or provisional (i.e. defeasible) substantive generalization.

example, that the human body cannot store water-soluble vitamins is relevant to establishing that there is no point in consuming a mega-dose of ascorbic acid at one time, since the premiss can be put together with the (correct) information that ascorbic acid is a water-soluble vitamin and that the human body cannot immediately use all of a mega-dose to form a set of propositions from which the conclusion follows, and the conclusion would not follow from this additional information if the human body could store water-soluble vitamins.[20] And that a conclusion follows from a premiss is not sufficient for that premiss to be relevant to it, because a proposition entails itself but is not relevant to establishing itself: any set of premisses which ineliminably includes the conclusion will not establish the conclusion, because it will be question-begging. If a premiss is relevant to justifying acceptance of a conclusion, however, it belongs to a set of propositions from which the conclusion follows and from which the conclusion would not follow if the premiss were false. On a semantic conception of consequence (Hitchcock 1985, 1987, 1992, 1994), this conception of premiss relevance is to that extent a semantic conception. It does not seem to be subject to the objections which John Woods (1994) has raised against other semantic conceptions of relevance.

The relevance of each premiss to the conclusion is not a distinct criterion for an argument's establishing its conclusion. Nor is it even a necessary condition for the argument's doing so.[21] If an audience has good reasons to accept the argument's premisses (reasons which do not include acceptance of the conclusion) and the conclusion follows from those premisses, then the argument establishes that conclusion for that audience (Hitchcock 1983). If the conclusion would still follow if a premiss were eliminated, then that premiss is irrelevant; if there is no such premiss, each premiss is relevant. The argument still establishes its conclusion if it contains an irrelevant premiss; it is simply inelegant because of this superfluity. Furthermore, even if each premiss is relevant, establishing their relevance requires judging for each premiss whether the conclusion follows from a set of propositions which includes it but not from the same set with the premiss in question supposed false; thus, judgments of relevance are epistemically posterior to judgments that a conclusion follows from a set of premisses.

[20]This example also shows that topical overlap is not a necessary condition for premiss relevance, since the premiss is relevant even though it shares no content expression with the conclusion. (Its link to the conclusion comes via links to the other premisses, which do have topical overlap with the conclusion.) Nor is topical overlap a sufficient condition for premiss relevance; the proposition that my car is grey is irrelevant to the proposition that my car has four wheels, even though the content expression 'my car' occurs in both propositions. The topical overlap which relevant logicians impose as a necessary condition on the entailment relation is not relevance in the sense in which most people use that term.

[21]Thus this account is at odds with the criteria for a good argument given by Johnson and Blair (1983) and by Govier (1988), both of whom take relevance to be an independently determinable necessary condition of a good argument, distinct from the other necessary conditions of adequacy and sufficiency. Both claim (falsely) that if a set of premisses is sufficient for a conclusion, then each member of the set is relevant. In that sense they do not regard relevance as an additional condition for a good argument.

Blair (1989) argues that what he calls 'narrow relevance', the property of having some bearing on or something to do with accepting a conclusion, is distinct from what he calls 'broad relevance', the property of being able to prove the conclusion. His examples of considerations relevant to making a decision and scientific evidence relevant to establishing a hypothesis certainly support his distinction. But the ability to distinguish relevance from what he and Johnson (1983) call sufficiency does not imply that relevance is an independent or even independently determinable criterion.

22.3 Fallacies of Relevance

22.3.1 Locke's 'Arguments ad'

The tradition of arguments ad goes back to 1690, when the English philosopher John Locke first published *An essay concerning human understanding*. In a parenthetical discussion at the end of a chapter entitled 'Of Reason' (Book IV, chapter XVII), Locke introduces a distinction between "four sorts of arguments that men, in their reasonings with others, do ordinarily make use of to prevail on their assent, or at least so to awe them as to silence their opposition" (Locke 1974/1690, vol. 2, p. 278). The only one of the four which for Locke brings true instruction and advances the interlocutor on the way to knowledge is "the using of proofs drawn from any of the foundations of knowledge or probability" (p. 279), a kind of argument he calls *argumentum ad judicium*, an argument to the judgment. Of the non-instructive ways of arguing, the first is to cite the opinions of men who have acquired an authoritative reputation; Locke calls this *argumentum ad verecundiam*, an argument to modesty, on the ground that its effectiveness rests on the fact that it is thought immodest (i.e. proud or impudent) to set one's own opinion against that of respected authorities. The second non-instructive way of arguing is to require an adversary in debate to admit what you allege or to produce something better; Locke calls this *argumentum ad ignorantiam*, an argument to ignorance, because it appeals to the adversary's ignorance of a better position than the one alleged. The third non-instructive way of arguing is "to press a man with consequences drawn from his own principles or concessions", a procedure which Locke claims to be already known under the name *argumentum ad hominem*, an argument to the man.

In the light of subsequent treatments of what we might call generically 'arguments ad', several features of Locke's account are worth noticing. In the first place, whereas most contemporary texts treat these types of arguments as arguments in monological texts, Locke is classifying arguments used in reasonings with others, and his descriptions of the *ad ignorantiam* and the ad hominem explicitly presuppose a two-person argumentative discussion in which one participant is attempting to secure the assent of the other to a thesis which he or she has advanced. Second, except in the case of the ad hominem, where Locke takes over an existing label (which we find in Aristotle (Hamblin 1970), Galileo (Finocchiaro

1974)[22] and the medieval logical tradition generally), Locke designates each form of argument by the aspect of the addressee's mind to which it appeals: modesty, ignorance, judgment. If we were to follow his lead, we would designate analogous forms of argument as appeals to pity, to fear, to the desire for popularity, to friendship, to wishes, to pride (Michalos 1970), to enmity (McMurtry 1986), and so forth. Except for the judgment, these are in general emotions, cognitive deficits (ignorance) or cognitive peculiarities (principles and concessions). Third, although Hamblin (Hamblin 1970, p. 161) claims that Locke does not clearly condemn any of these types of arguments, Locke clearly stigmatizes the three non-instructive ways of producing assent or silencing dissent; none of them, he says, proves the opinion to be right. The reception of truth "must come from proofs and arguments and light arising from the nature of things themselves, and not from my shamefacedness, ignorance, or error" (Locke 1974/1690, vol. 2, p. 279). Since Locke is claiming that these sources cannot produce knowledge, even in combination with other information, then according to the above analysis of relevance Locke is claiming that the *ad verecundiam*, *ad ignorantiam* and ad hominem are irrelevant to knowing whether the opinion for which they are offered as support is true.

In this claim he is largely correct. Such appeals to our emotions and our cognitive deficiencies and peculiarities generally do not bring knowledge, even when they legitimately cause assent to a proposition. The compassion we feel for a student whose father has just died may quite legitimately cause assent to the proposition that she should be given another week to hand in her essay, but such a deontic proposition is not a matter of knowledge. The fear of being assaulted may quite legitimately cause assent to the proposition that I should avoid high-crime areas after dark–another deontic proposition which is not a matter of knowledge. And, even though a defence lawyer's inability to prove that her client possessed a substantial quantity of marijuana for some purpose other than trafficking is sufficient in Canadian law to justify the judge, if not the defence lawyer herself, in assenting to the prosecution's contention that her client possessed it for the purpose of trafficking, the judge cannot be said to have gained knowledge from her inability to prove that the defendant possessed it for that purpose. Such appeals to our emotions or cognitive deficiencies do not produce knowledge, even if ineliminably

[22]This sense of ad hominem argument is distinct from the sense we find in contemporary North American textbooks of argument, according to which an ad hominem argument either abuses the other party to a discussion or points out something in his circumstances which is inconsistent with what he says. (Copi 1986) The abusive ad hominem is, as van Eemeren and Grootendorst (1992) assert, not a kind of argument at all, but a move at the confrontation stage of an argumentative discussion, a move illegitimately calculated to undermine the ability of the adversary to express his opinion. The circumstantial ad hominem, on the other hand, is an extension of Locke's conception to the case where the adversary has expressed a commitment to a given principle through his actions; we find this extension already in Whately (1827, pp. 191–193), who finds this form of argument quite legitimate in proving that the adversary is bound to admit the conclusion which follows from his principles, but fallacious if used to prove the proposition absolutely and universally. In any case the circumstantial ad hominem belongs to the argumentation stage and is relevant.

combined with other potentially accurate information, even if they legitimately cause assent to a proposition. This is not to say that making such appeals in argument is always a fallacy; if such an appeal would legitimately cause assent to a proposition, then it is not fallacious to use it to do so.

Locke, however, seems to have been wrong about the *ad verecundiam*. In some cases, admittedly, it does not bring knowledge. My modest reluctance to challenge the authority of the most eminent contemporary physicists quite legitimately bars me from dissenting from the special theory of relativity, but does not bring knowledge of its truth. But in other cases the *ad verecundiam* does bring knowledge. Hardwig (1988) argues that, if we allow that the cooperative methods of much modern research can bring knowledge, we must either count vicarious knowledge (i.e. knowledge based on the authority of others who claim to know) as real knowledge or attribute knowledge primarily to communities of investigators, not individuals. His arguments are convincing, and require us to acknowledge that the *ad verecundiam* brings knowledge and to specify the circumstances under which it does so.

22.3.2 Relevant and Irrelevant Emotional Appeals

Uninstructive as the ad hominem, *ad ignorantiam* and most appeals to emotions may be, their occasional legitimacy in causing assent to a proposition prevents us from stigmatizing them universally as non sequiturs, fallacies of irrelevance. As contemporary theorists of argumentation like Kielkopf (1980), Mackenzie (1981) and Woods and Walton (1989) have recognized, we need an account of when any such appeal is relevant and when irrelevant.

We have, let us suppose, an appeal to some emotion or some defective or peculiar cognitive state which is used to cause assent to a proposition. The proposition may be theoretical, a claim about what is the case, or practical, a claim about what to do. We may broaden our consideration to cases where the appeal is used to produce an action–for example, an appeal to patriotism used to sell war bonds; in such a case, the practical proposition "I should buy a war bond" may serve as a stand-in for the action of buying them, since whatever justifies the action will justify assent to the corresponding practical proposition. We may find such appeals in interactive discussion, where interpretation and analysis may be required to identify the proposition to which the interlocutor strives to produce assent by her appeal. Or we may find them in one-sided discourse, with the target proposition (the conclusion) sometimes unexpressed. The appeal need not be couched in words; a beer commercial showing attractive young men and women enjoying each other's company while sipping a particular brand of beer may appeal to our love of convivial socializing as a way of causing us to drink that brand–an *argumentum ad convivialitatem*, perhaps. It is always possible, however, to articulate verbally the aspects of such a depiction which influence us.

If such an appeal is effective, it is by definition causally relevant to acceptance of the proposition to which assent is sought. But our question is whether it is epistemically relevant, whether the message directed to our emotions or our defective or peculiar thinking can combine ineliminably with other potentially accurate information to give us good reason to assent to the target proposition. To settle this question, it must be possible to verbalize both the message and the target proposition. From the point of view of the recipient of the message, what is to be evaluated is the complex:

Message M, therefore proposition p.

Although the appeal may not be presented as an argument, a critical thinker trying to assess its epistemic relevance to assenting to the target proposition will view it as if it were an argument. Any attempt to get someone to assent to a proposition (or to perform an action for which assent to a proposition can serve as a stand-in) on the basis of the presentation of information is an argument when viewed critically.

If we apply our previously elaborated conception of epistemic relevance, we get the result that such an appeal to our emotions or cognitive deficiencies or peculiarities is epistemically relevant if and only if there is a linguistic formulation of the message which can be ineliminably combined with other at least potentially accurate information to support the proposition to which the message is designed to secure our assent.

22.3.3 The Consequence Relation

In judging whether a putatively relevant item of information can combine ineliminably with other (potentially) accurate information to support a conclusion, we need to apply some criterion for premisses supporting a conclusion. In addition to being non-question-begging, the premisses must imply the conclusion. Elsewhere I have proposed (Hitchcock 1985, 1987, 1994) that a conclusion follows from a set of premisses if and only if the argument is of a form that either definitely or probably or provisionally transmits truth from the premisses to the conclusion.[23] This

[23]The form in question will be what Toulmin (1958) calls a warrant, a rule of inference in virtue of which the conclusion follows definitely, probably or provisionally from the premisses. Thus this account agrees with Blair (1989) that an account of premiss relevance involves an appeal to Toulmin's warrants. But whereas Blair takes these warrants to be relevance warrants, the present account takes them to be sufficiency warrants, or at least provisional sufficiency warrants.

Blair (1989) and van Eemeren et al. (1987) object to Toulmin's claim that warrants are always general, on the ground that warrants are an answer to the question, "How does this follow?", and sometimes this answer is a particular proposition. For example, the warrant for the argument that the accused committed the murder because the accused is the only left-handed suspect may be that the murderer is left-handed. But a warrant is a rule of inference, obtained by generalizing on one or more content expressions repeated in the argument, at least one of which is shared by a premiss and the conclusion (Hitchcock 1985, 1987), and the principle of any such rule of inference can

conception of validity implies that at least one content expression will occur in both a premiss and the conclusion, and that the validity of the argument will hinge on one or more of such shared content expressions.

22.3.4 The ad Verecundiam

In a case where an item of information already shares a content expression with the conclusion to which it is putatively relevant, it would simplify our investigation of its claim to epistemic relevance if we could assume that this shared content expression would be the hinge of the validity of any argument of which it and the conclusion would form a part. For then the condition that there is additional potentially accurate information with which the original item can be ineliminably combined to support the conclusion would reduce to the condition that the conclusion may follow from the original item. Although I can at present produce no proof of this assumption, I make it for simplifying purposes.

An *argumentum ad verecundiam* has the following form:

x is a respected authority. x says that p. Therefore, p.

This form is not valid, since respected authorities do not always, or even mostly or provisionally, speak the truth. We can, however, specify additional information which could be added to make the argument form at least provisionally valid. If p belongs to a cognitive domain K[24] in which x has expertise and x's statement that p results from x's using that expertise, then p is at least provisionally true (The provisos would include such conditions as the proposition's not being contested by other experts in the cognitive domain and x being unbiased). Each of these additional conditions provides a basis for stigmatizing an appeal to authority as irrelevant. If the authority is not based on expertise, or the expertise is in a domain other than the one to which the proposition belongs, or the proposition does not belong to

(Footnote 23 continued)

therefore always be expressed as a general proposition. In Blair's example, the warrant is: From 'x is the only left-handed suspect', you may infer 'x committed the murder'; and the principle of this warrant can be expressed as the general proposition that whoever is the only left-handed suspect committed the murder. The same point can be made for examples where the inference-licensing assumption is apparently particular, for example, the argument that Jesus is mortal, because all men are mortal–an argument whose inference-licensing assumption is that Jesus is a man. The warrant for this argument is: From 'all men are F', you may infer 'Jesus is F'; and the principle of this warrant can be expressed as the general proposition that Jesus has all the properties which all men have. This proposition, a universal generalization of second-order predicate logic, is equivalent to the singular proposition of first-order predicate logic that Jesus is a man. All singular propositions are equivalent to general propositions.

[24]By a cognitive domain I mean a set of propositions whose truth-value can be arrived at through the application of a structured body of knowledge–for example, propositions about Dutch postage stamp designs, or propositions about Michigan's laws on defamation.

a cognitive domain, or the authority is not using their expertise in arriving at the proposition, then the fact that they are saying that p cannot be ineliminably combined with other potentially accurate information to support the conclusion that p. Notoriously, a star athlete's endorsement of a product is irrelevant to deciding to buy it, since the athlete's authority is not based on expertise, or at any rate not on expertise in the domain to which judgments of the worth of the product belong. Nor is a physician's assertion that a certain course of treatment will benefit the patient relevant to the truth of the assertion, for judgments about what is beneficial for a patient are not (solely) matters of expertise, but depend upon the wishes and goals of the patient. (Physicians' expert opinions on the possible outcomes of different courses of treatment and their probabilities are however highly relevant to patients' decisions on whether recommended courses of treatment will benefit them.)

Such judgments of irrelevance are rather easily made. They do not bear upon the difficult questions which arise when experts use their expertise to make claims which are in their domain of expertise: how to cope with disagreements among experts within their domain, how much it is reasonable to rely on expertise and how much to scrutinize the credentials of an expert. But we should not expect an account of fallacies to decide such subtle questions. Fallacies are supposed to be gross errors, and their identification and recognition is merely a device to protect us from the crudest mistakes into which we are likely to fall in our thinking.

22.4 Conclusion

Relevance is a triadic relation between an item, an outcome or goal, and a situation. An item is relevant to an outcome or goal in a situation if and only if it can help to produce that outcome or goal in the situation. Within the set of triples for which relevance is defined, irrelevance is its contradictory. Irrelevance is not a matter of degree, but relevance may be. Epistemic relevance, potential contribution to an epistemic goal, is distinct from causal relevance, although recognition of the epistemic relevance of an item of information makes it causally relevant. Strictly speaking, epistemic relevance is irreflexive, symmetric and vacuously transitive; loosely speaking, it is either reflexive or irreflexive (depending on the epistemic goal), non-symmetric and transitive.

An item of information is epistemically relevant to an epistemic goal in a situation if it can be ineliminably combined with other (potentially) accurate (warranted, accepted) information to achieve the epistemic goal. This account can be applied to the analysis of conversation (both argumentative and non-argumentative) and argument (both conversational and non-conversational). An argument has an irrelevant conclusion if its conclusion cannot be ineliminably combined with other potentially accurate information to achieve the epistemic goal to which the argument is addressed. It has an irrelevant premiss if the premiss cannot be ineliminably combined with other potentially accurate information to achieve the epistemic goal to which the argument is addressed.

The family of *argumenta ad* which descend from Locke's *Essay* are claimed to be fallacies of relevance in the sense just defined. Locke in particular characterized the *ad verecundiam*, *ad ignorantiam* and ad hominem as fallacies of relevance with respect to the epistemic goal of instruction, for he claimed that such appeals never bring us knowledge. He is largely right in this claim. But such appeals are not necessarily irrelevant with respect to other epistemic goals. The *ad verecundiam* is irrelevant to the goal of rational acceptance of its conclusion when the authorities appealed to have no expertise in a cognitive domain to which the conclusion belongs or they do not exercise their expertise in endorsing the conclusion or the conclusion does not belong to a cognitive domain. Otherwise it is relevant.

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Chapter 23
Good Reasoning on the Toulmin Model

Abstract Some solo verbal reasoning serves the function of arriving at a correct answer to a question from information at the reasoner's disposal. Such reasoning is good if and only if its grounds are justified and adequate, its warrant is justified, and the reasoner is justified in assuming that no defeaters apply. I distinguish seven sources of justified grounds and state the conditions under which each source is trustworthy. Adequate grounds include all good relevant information practically obtainable by the reasoner. The claim must follow from the grounds in accordance with a justified general warrant. If this warrant is not universal, the reasoner must be justified in assuming that no exception-making circumstances hold in the particular case to which it is applied.

23.1 Introduction

Toulmin (1958, 2003) advanced his model for the layout of arguments without providing criteria for evaluating arguments so laid out. Some criteria are given in his co-authored textbook based on this model (Toulmin et al. 1978, 1984). On page 238 of the 1984 edition, for example, the authors prescribe eight "essential merits" of arguments: clarity on the kind of issues the argument is intended to raise, clarity

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on the underlying purpose of the argument, grounds relevant to the claim, grounds sufficient to support the claim, warrant applicable to the case under discussion, warrant based on solid backing, modality or strength of the resulting claim made explicit, possible rebuttals or exceptions well understood. But these conditions are underdeveloped. The textbook focuses rather on the structure of arguments and on the forms their components take in different fields.

Toulmin's model applies not only to arguments, whose authors address verbalized reasoning to someone else, but also to solo verbal reasoning, in which reasoners draw conclusions for themselves from information at their disposal. I shall propose guidelines for such reasoning, from the perspective of someone about to engage in it rather than of someone critically evaluating it after the fact. Solo verbal reasoning as I understand it must have some verbal components (merely thought, spoken aloud, written, signed, etc.) but can have non-verbal components. For example, its grounds can include non-verbal perceptual stimuli or non-verbal symbolic artefacts such as figures and drawings. In what follows, I shall use the unqualified term "reasoning" as a convenient abbreviation for "solo verbal reasoning" as just defined. I shall assume that the Toulmin model and its components (claim, grounds, warrant, qualifier, rebuttal, backing) are known, and shall propose criteria for good reasoning in terms of the components of this model. I shall use 'conclusion' as a synonym of 'claim' and 'premisses' as a synonym of 'data' or 'grounds'; the latter usage reflects my position, argued elsewhere (Hitchcock 2003), that the warrant of an inference is not a premiss but an inference-license. Although I shall not discuss solo non-verbal reasoning, I make no assumption about whether the Toulmin model applies to such non-verbal reasoning.

Goodness of a kind is relative to function. A good eye is one that has characteristics that are sufficient for seeing well. A good bread knife is one that has characteristics that are sufficient for cutting bread well. Similarly, good reasoning is reasoning that has characteristics that are sufficient for accomplishing well the function of the reasoning. Reasoning in fact has many functions, for each of which there will be a correlative account of its goodness. I shall focus on one common function of reasoning: to arrive at a correct answer to a question whose answer is not immediately obvious to the reasoner but may be inferred from information at the reasoner's disposal. The question may be purely theoretical: Why did the airplane hijackers who attacked the World Trade Centre choose September 11 as the date of their attack? Or it may be practical, or practically oriented: What possible difficulties do I need to be aware of before starting to install a central vacuum system in my house? How long will it take to get to a place I plan to go to tomorrow? What is the best way of handling my two-year-old's temper tantrums? Sometimes the answers to such questions are obvious, but when they are not, and we have or can get information from which to work out an answer, reasoning is appropriate. Naturally we want to arrive through this reasoning at a correct answer.

There is of course no litmus test or gold standard for correctness of conclusions. We cannot write the conclusion on a piece of paper, dip it in a liquid, and determine from the colour of the paper whether the conclusion is correct or incorrect. We are not infallible visionaries, but human beings, working with incomplete information

of less than perfect quality. Instead of correctness or truth, we must make do with the next best alternative: justification by the best practically obtainable evidence. This is why many warrants hold in most or some cases rather than in all cases, why we qualify our conclusions with such words as 'probably' or 'possibly', and why we acknowledge potential rebuttals.

Our immediate goal, then, is to reach the answer that the best relevant practically obtainable evidence justifies us in accepting. I propose four individually necessary and jointly sufficient conditions for reasoning that reaches this goal. First, we must be justified in accepting the ultimate grounds on which we base our reasoning. Second, our grounds must include all the relevant justified practically obtainable information. Third, the conclusion must follow in virtue of a justified warrant. Fourth, if the warrant is not universal, we must be justified in assuming that in the particular case there are no defeaters that rule out application of the warrant. I propose these conditions for reasoners to apply to their own reasoning, thus abstracting from consideration of the audience and dialogical context when reasoning is verbalized to others.

Let us now consider each of these conditions in detail.

23.2 Justified Grounds

It is perhaps self-evident that good reasoning with a function of arriving at a previously unknown correct answer to a governing question must start from grounds that we are justified in accepting. Correct conclusions can follow from incorrect premisses, but it is an accident if they turn out to be correct. To have some assurance of reaching our goal, we need justification for our starting-points.

There are many sources of justified premisses. The most trustworthy ones appear to be direct observation, written records of direct observation, memory of what one has previously observed or experienced, personal testimony, previous good reasoning or argument, expert opinion, and appeal to an authoritative reference source. None of these sources is infallible. Further, the list is open to emendation; in particular, it makes no special allowance for evaluative or normative ultimate premisses.

23.2.1 Direct Observation

In general, the most basic source of justified premisses is direct observation. Seeing the thick black clouds getting ever larger in the western sky is good justification for believing that thick black clouds are forming in the western sky. Hearing the screaming of one's two-year-old rapidly diminish in loudness after he is put into his room alone is good justification for believing that the temper tantrum faded away after he was put in his room alone. The smell of smoke is good justification for

believing that there is smoke in the air one is breathing in. Observation includes not only such witnessing by the human senses but also the reception of information by some sensory apparatus like a telescope; Norris (1979) identifies observation with determining by the use of human or other sensory apparatus on some specific occasion what is happening or what state something is in, Shapere (1982) with reception by an appropriate receptor of information transmitted without interference from the observed entity. Observation so defined depends logically on a theory of the source of the information, a theory of its transmission and a theory of its receptor; if an observation is to be credible, such well-established theories must apply and the observer must at least know of their existence and applicability (Kosso 2001). But such background theories are not a part of the observer's reasoning. Rather, the observation is the starting-point, and it is used as the basis for further inferences, which in general will be less reliable than the observation (Norris 1979). As physical knowledge increases, and new sensory receptors are invented and improved, the range of what can be observed expands; an extreme example of such expansion is the observation of the centre of the sun by the detection of neutrinos a mile beneath the earth's surface, discussed in a well-known paper by Shapere (1982).

Thus observation is not a passive reception of ready-made facts. Rather, it involves description and justification, description in expressing informational content in an observation report (possibly to oneself) and justification in that it must be possible to show that the report is about something (the source of the information, the observed object) and that it is accurate (Kosso 1992, p. 113).

When is an observation justified? Norris (1984) has proposed criteria for observing well, for reporting observations well and for appraising observation reports; the latter criteria incorporate those proposed by Ennis (1962, p. 90) and by Norris (1979, pp. 18–20) and by Norris and King (1984, p. 7). Such lists are derived from common-sense experience, from the practice of scientific observation, from the results of psychological experiments, and from treatment of eye-witness testimony in law courts; and are subject to correction from these sources. Synthesizing the work of Ennis and Norris with reports by Loftus (1979) and by Loftus and Doyle (1992) of the results of psychological studies, we can say that, in general, an observation is justified to the extent that the following conditions are met:

1. *Well-established background theories* of the source of the information, its transmission and the receptor show that the receptor in such an observational situation accurately receives information from the source under normal conditions.
2. *The sense or sensory apparatus being used* (e.g. sight, hearing, photographic plates, radar equipment, neutrino detectors) *is in good condition and functioning properly*. In particular, a human observer should be functioning at a moderate level of emotional arousal, neither so torpid as to be only dimly aware of the surroundings nor so highly stressed as to be incapable of observation of the complexity required (Loftus 1979, pp. 33–36; Loftus and Doyle 1992, pp. 29–33).

3. *The conditions for observation are adequate*. If the observer is using a human sense, the event must be within the observer's perceptual range: bright enough, loud enough, close enough to be picked up by the ordinary senses (Loftus 1979, p. 22). Also, the medium of observation should not systematically distort the observed characteristic. Also, the more time there is to make the observation and the more opportunities there are to make the observation, the more likely is it that the observation is accurate (Loftus 1979, pp. 23–25).
4. *The information being received is of a sort that is generally accurately detected by the receptor*. This condition can be made more specific for human sense perception, as follows. The observed state of affairs should be salient, in the sense that it would be mentioned without prompting if the observer were to report immediately on what had just been observed (Loftus 1979, pp. 25–27). Humans should be generally accurate at observing the type of fact being observed; for example, the duration of an event is not usually accurately observed, but is typically overestimated, particularly when an observer is feeling stress or anxiety (Loftus 1979, pp. 27–31). If the observation concerns details of an event, the event should not be emotionally loaded (Loftus 1979, pp. 31–32; Loftus and Doyle 1992, pp. 24–29).
5. *The observer takes care to notice accurately*. Observation tends to be more accurate if the observer actively uses one or more senses to take in details of what is observed, rather than just attending to one aspect of the situation (Loftus 1979, pp. 48–49).
6. *The observer, if human, is primed to observe accurately*. The observer should not be biased by previous expectations (cultural, personal, experiential or temporary) of what is going to be observed (Loftus 1979, pp. 36–48; Loftus and Doyle 1992, pp. 36–40). Observation tends to be more accurate if the observer has information before the observation that indicates the importance of correct observation in the situation (Loftus 1979, pp. 49–51).
7. *The observer has whatever expert knowledge is required to use any instruments involved* (e.g. a telescope) *and to interpret what is observed*.
8. *No other justified information contradicts the observation*.

An observation that meets the just-mentioned criteria may nevertheless turn out to be incorrect. Things formerly taken to be observed accurately can later be discounted as due to defects in sensory equipment or to mistakes in some theory used to interpret the equipment's output. Here, as elsewhere, justification is not truth.

23.2.2 Written Records of Direct Observation

A second source is written records of direct observation. Such records are important in many professional contexts where the content of observations must be available and accurate long after the observation is made, such as scientific research, police investigation and medical examination. Written records make it possible to restore

previous observations without depending on the vagaries of memory, which is notoriously plastic and unreliable (Schacter 1995). Norris (1984, p. 136) proposes the following criteria for good records of observations:

1. The observation should be reported no more precisely than can be justified by the observational technique that was used.
2. The record should be made close to the time of observing.
3. The record should be made by the observer.
4. The record should be made in the same environment in which the observation was made.

23.2.3 Memory

A third source is memory of what one has previously observed or experienced. Human memory is basically accurate; we would not cope as well as we do if we did not remember accurately how to get from A to B, where we left something we now want, and so forth. But it is subject to decay and error. As the work of Loftus (1979) among others has shown, distortions and failures can occur not only at the initial acquisition stage (the observation) and at the later retrieval stage, but also during the intervening retention stage—human memory is plastic. In *The Seven Sins of Memory*, Schacter (2001) classifies the causes of inadequate human memory. Three of his seven "sins" are sins of omission, causing failure to retrieve the desired information: absent-mindedness (lack of attention resulting in failure to store the information in the first place), transience (the fading of memory over time), and blockage (inability to retrieve something that is still stored in our memory). Another three "sins" are sins of commission in which we retrieve distorted information: misattribution (assigning what is remembered to the wrong source, even to reality rather than fantasy), suggestibility (implantation by leading questions, suggestions or comments at the time of retrieval), bias (editing of our remembered past in the light of current beliefs). The seventh "sin" is a source neither of failure nor of distortion, but of unwanted intrusion: persistence involves repeated recall of disturbing information that we would prefer not to think about. Schacter argues somewhat speculatively (2001, pp. 184–206) that these seven inadequacies are by-products of otherwise adaptive features of human memory.

Schacter's sins of commission warn us to attend to factors that reduce the accuracy of human memories. In particular, episodic memories decline in accuracy with the passage of time (Loftus 1979, pp. 53–54; Schacter 1995, pp. 25–26). Subsequent information or misinformation, especially when delayed or about peripheral details, can distort one's memory, even to the extent of adding non-existent objects to one's memory of an episode or changing the type, colour or subjective impression of observed objects (Loftus 1979, pp. 54–78; Loftus and Doyle 1992, pp. 61–66). One's own thought processes—one's biases, one's labeling, one's guessing what one observed, one's verbalizing of a recollection—

can affect how one stores in memory an observed episode (Loftus 1979, pp. 78–87). Memories are in general less accurate about peripheral or unimportant details than about emotionally salient and central facts (Schacter 1995, p. 16). False episodic memories can be produced in neurologically unimpaired adults by association with actual stimuli, by inferences from misinformation about the stimuli, by leading questions, by post-event misinformation, by previous forced guessing, by hypnosis, by emotional arousal at the time of observation (with respect to peripheral details), or by an incongruent mood (Schacter 1995). The presentation of false post-event information commonly distorts memories in four circumstances: much time has elapsed, the false information is embedded in a subsidiary part of an information-seeking question, the observed event was violent (thus disrupting the initial storage of information in memory), and there is no warning immediately before receiving a post-event message that the message may contain misinformation (Loftus and Doyle 1992, pp. 68–70). The information one retrieves from memory can be affected by whether the retrieval environment is the same environment in which the original observation was made; if the information is retrieved in response to questions, it can be affected by what types of questions are asked, how they are worded and who is asking them (Loftus 1979, pp. 88–99). One's confidence in the accuracy of one's memory is not necessarily a good guide to how accurate it is (Loftus 1979, pp. 100–104; Loftus and Doyle 1992, pp. 75–77). Thus reasoners need to be careful about relying on memory alone. Loftus and Doyle cite experimental evidence, however (1992, pp. 81–83), that one can improve one's memory of an episode by taking oneself through the four stages of a so-called "cognitive interview": reinstate mentally the context of the episode, report everything, recall events in different orders, recall the episode from different perspectives.

23.2.4 Personal Testimony

A fourth source is personal testimony of what has been directly observed or experienced. Such testimony is no better than the observation or experience on which it is based. It must be scrutinized in terms of the criteria mentioned earlier for observation, written records, and memory. For example, testimony based on distant memories is suspect if unsupported by written records made at or near the time of the observation. Even apparently honest reports of current experiences must be evaluated for accuracy, since they can be unclear or involve questionable interpretation. Criteria for evaluating observation reports can be found in Ennis (1962, p. 90), Norris (1979, pp. 18–20; 1984, p. 137), and Norris and King (1984, p. 7).

It is particularly important in evaluating testimony to be on guard against second-hand, third-hand, or more distant testimony. As the game of "telephone" dramatically shows, the quality of messages passed from one person to another tends to deteriorate with each transmission. An additional complication in evaluating testimony is the possibility that its author may distort the truth through a

careless or intentionally deceptive formulation. Self-deception, faulty interpretation, and sloppy verbalization are more common than intentional deception.

23.2.5 Previous Reasoning or Argument

A fifth source is previous good reasoning or argument. The reasoner may already have reached a relevant conclusion by previous reasoning, for example that the date of September 11 is likely to have had some significance for the cause promoted by the attacks on the World Trade Center. Alternatively, the reasoner may have been convinced by someone else's argument to accept a relevant conclusion of that argument. If the relevant conclusion was justified by the earlier reasoning or argument, it becomes a justified premiss of the new reasoning.

23.2.6 Expert Opinion

A sixth source is expert opinion, such as the opinion of a qualified electrician on the adequacy of a circuit for a particular appliance. In some cases, it is possible and desirable to scrutinize the reasoning by which the expert arrived at the opinion in question. In other cases, however, it is either impossible or undesirable to undertake such scrutiny, and the acceptability of the expert's opinion must be judged indirectly.

Ennis (1962, pp. 196–197) proposed criteria for evaluating expert opinion. Modifying his list in the light of reflection on the ways in which experts' opinions might be mistaken, we can say that, in general, expert opinion justifies a claim to the extent that the opinion meets the following seven conditions:

1. The opinion in question must belong to some subject matter in which there is expertise. An opinion can belong to an area of expertise even if the expertise is not based on formal education; there are experts on baseball and on stamps, for example.
2. The author of the opinion must have the relevant expertise. It is important to be on guard against "expert fixation", accepting someone's opinion because that person is an expert, when the expertise is irrelevant to the opinion expressed.
3. The author must use the expertise in arriving at the opinion. The relevant data must have been collected, interpreted, and processed using professional knowledge and skills.
4. The author must exercise care in applying the expertise and in formulating the expert opinion.
5. The author ideally should not have a conflict of interest that could influence, consciously or unconsciously, the formulated opinion. For example, the acceptance of gifts from the sales representative of a pharmaceutical company can make a physician's prescription of that company's drug more suspect.

6. The opinion should not conflict with the opinion of other qualified experts. If experts disagree, further probing is required.
7. The opinion should not conflict with other justified information. If an expert opinion does not fit with what the reasoner otherwise knows, one should scrutinize its credentials carefully and perhaps get a second opinion.

Sometimes we do not know directly whether these seven conditions are met, and we must judge by inference. The track record of an expert in the relevant field of expertise is good evidence, positive or negative, about the trustworthiness of that expert's new opinion. Awareness by the expert that others will subject the opinion to scrutiny counts in favour of its trustworthiness.

23.2.7 Authoritative Reference Source

A seventh source is an authoritative reference source, such as an encyclopedia or the *Handbook of Chemistry and Physics*. Authoritative reference sources differ from expert opinions in that they contain generic information, whereas expert opinions apply expertise to a particular situation. Ideally, authoritative references embody the best available evidence at the time they are composed.

23.2.8 General Remarks

No matter how one's premisses are justified, it should be kept in mind that being justified is not the same as being correct. A premiss justified by direct observation, or by a written record of a direct observation, or by an authoritative reference source, may later turn out to be false. The friend one "sees" across the road may turn out on closer inspection to be someone else who looks like one's friend. The secretary taking notes at a meeting may have misheard or misinterpreted what was said. An entry in a reputable encyclopedia, general or specialized, can be superseded by subsequent research or world events. The moral is: One should always be prepared to revise one's opinion in light of compelling new evidence to the contrary.

23.3 Adequate Information

If one is trying to answer a question correctly on the basis of obtainable information, one needs to take into account all the good relevant information that is practically obtainable. Relevant information is information that could make a difference to the answer one reaches. That is, a justified warrant links it, in

combination with other already obtained or obtainable information, to an answer to the question that could be different than the one justified by the information already obtained. In many contexts—such as medical diagnosis, police investigation, military and other intelligence work, scientific research, interpretation of such symbolic artefacts as written texts or works of art or musical compositions, adjudication, consumer choice—different pieces of information often point to a different answer to a given question. Hence, if in such a context one considers only information that supports one answer, and ignores information that points to a different answer, one is more likely to reach an incorrect conclusion than if one considers everything. A common human failing is to close prematurely on a particular answer, then seek supporting evidence for this answer, while failing to seek (or even ignoring) evidence that points in a different direction. Indeed, high school English teachers often teach their students to write essays this way: Adopt a thesis, then assemble evidence to support it. This is a fallacy of empirical investigation known to psychologists as "confirmation bias" (Klayman 1995). Both experimental-critical and historical-textual empirical investigators of human reasoning have concluded that the most common flaw of informal reasoning is the failure to consider lines of argument supporting conclusions contrary to the one reached (Finocchiaro 1994). The mass media occasionally report examples of such failures in detective and intelligence work: convictions for murder are sometimes reversed on the basis of DNA evidence, and intelligence estimates of a foreign country's military preparations sometimes prove wildly inaccurate. Confirmation bias occurs in a subtle way in the publication in scientific journals of experimental results that are tested for their statistical significance. Since the best journals are distinguished by the strictness of their criterion, accepting only results that are significant at the 0.01 level (as opposed to the 0.05 level or 0.10 elsewhere), the published evidence relevant to a given empirical question can be a biased sample of the evidence actually obtained by researchers.

In working out the correct answer to a question, one needs to consider only information that is good, relevant to the question, and practically obtainable. In other words, one can ignore information that is either bad or irrelevant or not practically obtainable.

Information used to arrive at an answer to one's question must be good information, in terms of the conditions previously mentioned for justified premisses. There is no point in taking bad information into account, still less in devoting time and effort to acquiring it.

Information used to arrive at an answer to one's question must be relevant, in the sense that taking it into account might make a difference to one's answer. Relevance is thus a function of context. Suppose the question is whether all swans are white. We have a justified assumption, well supported by direct and reported observation of birds of both sexes in many species, that birds of a single sex in a single species have uniform colouring; for example, all male cardinals have the same bright red colouring. Suppose that we are aware of observations of swans of both sexes in each of many species: mute swans, trumpeter swans, whistling swans, and whooper swans. Suppose that all observed swans of these species were seen to be white.

Then observing more swans of any one of those species, of either sex, is irrelevant; we have strong reason to believe that no such additional observation will produce a different answer to our question. But then we hear reports that there are different species of swans in the southern hemisphere. Observing swans of those species is relevant. Once we become aware of observations of the "black swans" of Australia and New Zealand, which are as black as their name implies, then no further observations of swans is relevant; we have conclusive proof in the last observations of a negative answer to our question: not all swans are white. In general, if the justified premisses at one's disposal support an answer to one's question that no additional evidence can overturn, then no such further additional evidence is relevant. Of course, if further information casts doubt on one or more of those justified premisses, then the situation can change.

Finally, information used in arriving at a correct answer must be practically obtainable. The word "practically" implies relativity both to the time and effort required to obtain the information and to the importance that one answer the question correctly and to the urgency of arriving at an answer. If it will take a two-minute Internet search to get relevant information of good quality, and one has the two minutes to spare, and it is important that the answer be correct, and one can wait two minutes before closing in on an answer, then one ought to do the Internet search. If the question is whether to quarantine a patient with symptoms like those of sudden acute respiratory syndrome (SARS), a contagious viral infection with a 15% mortality rate, and it takes a week to get the result of a "gold standard" test of the patient's blood sample, then one quarantines the patient first (unless one can immediately exclude a diagnosis of SARS) and reviews the quarantine decision after receiving the result of the blood test. There is of course no general algorithm for balancing considerations of time, effort, urgency and importance of correctness in deciding whether it is practical to obtain a certain piece of good relevant information. Judgment is required. There may however be algorithms for determining in specific domains whether it is practical to obtain good relevant information.

23.4 Justified Warrant

If one's reasoning is to justify one's conclusion, that conclusion must follow from one's premisses in accordance with a justified general warrant.

The phrase "in accordance with" means that the warrant actually applies to the inference. In other words, the warrant is semantically equivalent to some generalization of the reasoning's associated conditional "if p_1 and … and p_n, then c", where p_1, … p_n stand for the premisses and c for the conclusion (with qualifiers and rebuttals removed). The requirement that the warrant actually apply to the inference should be obvious. A subtle danger in reasoning, which reasoners may not notice, is the use of a generalization of the converse of the associated conditional. For example, one may reason from hearing a train-like whistle that a train is in the

vicinity. Reflecting on why one thinks this follows, one might propose the generalized warrant: If a train is in the vicinity, then I hear a whistle like the one I just heard. But this is the converse of the required warrant, which is rather: If I hear a whistle like the one I just heard, then a train is in the vicinity. This warrant may not be justified; for example, one may be aware that one has a neighbour who is a train aficionado addicted to playing recordings of trains at high volume and that there are no train tracks in one's vicinity (If the conclusion is qualified by the word 'possibly', then a generalization of the converse may support the inference, in so-called abductive reasoning, i.e. reasoning from some observed phenomenon to a hypothesis that may explain it. But the generalization of the converse seems to be in Toulmin's terminology backing for the warrant, rather than the warrant itself. The warrant is: whenever someone hears a train-like whistle it may be produced by a nearby train. The backing for this warrant is: If the driver blows the whistle of a nearby train, it makes a sound like the sound I just heard.).

In addition to being applicable, the warrant must be general. No conclusion follows in just one particular case; if it follows in one case, it follows in parallel cases. An applicable warrant picks out a class of such cases. It is important to realize that there may be several ways of doing so. In general, warrants generalize over the repeated content expressions of one's reasoning, and they must generalize over at least one content expression that occurs both in a premiss and in the conclusion (Hitchcock 1985). If more than one content expression is repeated, then the reasoning has several potential warrants for the inference. Furthermore, the extent to which one generalizes over a given content expression is variable. In the example just mentioned of the train-like whistle, one might generalize over the implicit time constant "now" to all times, to a given time of day, or to a given time interval like the current calendar year. These three generalizations produce three different warrants: whenever I hear a whistle here that sounds like this a train is in the vicinity, whenever at about 7 p.m. I hear a whistle here that sounds like this a train is in the vicinity, whenever in the current calendar year I hear a whistle here that sounds like this a train is in the vicinity.

The requirement that the warrant be general is not a requirement that it be universal. Warrants, as Toulmin pointed out, can be modally qualified, as holding for the most part, or *ceteris paribus*, or even just sometimes. Such qualifications, along with qualifications of the epistemic status of the warrant, imply imperfect support for the conclusion, which may or may not be explicitly marked in one's reasoning.

Finally, the warrant must be justified. It is neither necessary nor sufficient that the warrant actually hold, i.e. that the generalization is correct (whether universally, for the most part, or ceteris paribus). Correctness of the warrant is not sufficient, because reasoners need to draw inferences in accordance with warrants of which they are actually aware. Thus, for example, a logic student in the 1920s who considered axiomatized Peano arithmetic could not use the correct generalization that no consistent axiomatization of arithmetic is complete to draw the conclusion that axiomatized Peano arithmetic is incomplete, because this generalization had not yet been shown to be true. Correctness of the warrant is not even necessary, for the

same reason that it is not necessary that the premisses of good reasoning be true. Fallible human reasoners with limited resources have no direct access to truth, or more broadly to correctness; they must make do with what at any given time they are justified in accepting. The corollary of this fallibility is that good reasoners must be ready to revise their cognitive commitments, including the warrants in accordance with which they reason, in the light of new good evidence.

In Toulmin's model, warrants are justified by backing. His conception of backing, and his distinction between warrant-using and warrant-establishing arguments, are linked to his strong field-dependency thesis, about which reservations have been expressed, for example in several chapters of Norris (1992). In fact, there seems no reason to postulate a sharp difference in kind between warrant-using reasoning and warrant-establishing reasoning. If one is reasoning to a conclusion that will later serve as a warrant for further reasoning, the conclusion is one's claim and the "backing" for that claim constitutes one's grounds; the inference from grounds to claim will have its own warrant. In good medical reasoning, for example, conclusions about individual patients are reached using so-called "evidence-based" generalizations about risk factors, diagnosis, prognosis or treatment. The evidence that justifies such generalizations tends to take the form of clinical trials and other analytical studies, the conclusions from which are incorporated through meta-analysis and systematic review into authoritative clinical guidelines and references. Reasoning from the results synthesized in a systematic review to a clinical guideline is, in Toulmin's terminology, another instance of reasoning from grounds to a claim, only at a higher level than reasoning that applies a clinical guideline to the observed circumstances of a particular patient.

23.5 Justified in Assuming no Defeaters Apply

A well-known feature of Toulmin's model is that many warrants come with rebuttals, or exceptional conditions under which the warrant lacks authority or is inapplicable, or the conclusion is false; Verheij (2006) has clearly distinguished these various types of rebuttals, which Toulmin lumps together. If the warrant that justifies one's inference is not universal, one must be justified in assuming that no exceptional condition in the particular case rules out application of the warrant. Such exceptional circumstances include not only circumstances that show that the conclusion is incorrect but also circumstances that show that the warrant is inapplicable to a particular situation, even though the conclusion may be correct. The former type of exceptional circumstance, one that shows the conclusion to be incorrect, may be said to override (Pinto 1999) or rebut (Pollock 1970) the warrant; a standard example is the circumstance that a bird is a penguin, which overrides the warrant that birds fly (since penguins do not fly). The latter type of exceptional circumstance, one that shows the warrant to be inapplicable even though the conclusion may nevertheless be correct, may be said to undermine (Pinto 1999) or undercut (Pollock 1970) the warrant; a standard example due to Pollock (1995) is

the undermining of the warrant that things that look red are red by the circumstance that the object one is looking at is illuminated by a red light. The distinction between overriding defeaters and undermining defeaters was first made by Pollock in his (1970); there may be other types of defeaters. Verheij (2006) has added two other types to Toulmin's three types of defeaters, and has developed a subtle theory of the way in which the justification status of the components of the Toulmin model changes as defeaters of various sorts are acknowledged, including defeaters of defeaters. For the warrant in particular, the central point is that, if one is not justified in assuming that a warrant lacks defeaters in the particular case, then one's conclusion about that case is obviously unjustified.

The condition that one is justified in assuming that no defeaters apply is weaker than the condition that one has a justification (i.e. proof) that no defeaters apply. To require a reasoner using a non-universal warrant to have a justification that no defeaters apply is to impose too great a burden of proof on the reasoner. The non-existence of a defeater is not a ground from which the reasoner arrives at a given conclusion; if it were, the reasoner would need to have as good a justification for it as for any ground. Rather, defeaters are something to be aware of as a possibility; in many cases, there are indefinitely many possible defeaters, and it would paralyse reasoning to require a reasoner to have a justification for excluding each and every one of them.

What does it take to be justified in assuming that no exception to a warrant applies to the particular case about which one is reasoning? In some situations, institutional and legal requirements impose obligations to determine whether anything about a particular case defeats the warrant. For example, a detective must ensure that the evidence that can be presented in court will be sufficient to prove beyond a reasonable doubt that the suspect is guilty of a criminal offence. A physician has a duty to conform to recognized standards of care. Such institutional requirements can be given a consequentialist justification.

More directly, in the absence of such institutional requirements, one can take a directly consequentialist approach. First, one must know of no exception to the warrant in the particular case. Second, if an exceptional condition has serious consequences and one can find out without too much difficulty whether it is present in the particular case, one must find out whether the exceptional condition is present. For example, it is generally safe to start across an intersection when the light turns green, but not if another vehicle is running a newly red light on the cross street. Since it takes only a brief look in each direction to find out if any vehicle is running the red light, an appropriately careful driver will look in each direction as the light turns green (The example is a bit artificial, since the behaviour of experienced drivers in such routine situations is a matter of automatic habit, but reasoning can be used in forming such habits, for example, in driving instruction.). The more serious the consequences of an exception, the more effort one should be prepared to put into finding out if it is present. It is a matter of judgment where to draw the line. Third, if one knows of no exception and one's pragmatically justified investigation has not discovered an exception, one can draw one's conclusion as if there is no exception. But one should be alert to the possibility of discovering at a

later time some exceptional circumstance pertaining to the particular case. If one's observation of a clock leads one to conclude that the time is 10:15, and shortly after one sees another clock which reads 11:20, then one should suspend judgment as to what time it really is until one finds out which of the two clocks is correct.

23.6 Summary and Comparison

The four conditions—justified grounds, adequate information, justified warrant, justification in assuming no exceptions apply—are individually necessary and jointly sufficient for good reasoning. If any one of the four conditions is absent, the reasoning is not good; it does not justify the conclusion. If they are all present, the reasoning is good; it does justify the conclusion.

Only two of the four conditions are intrinsic to the parts of the reasoning: justified grounds and justified warrant. The other two—adequate information and justification in assuming no exceptions apply—are characteristics of the activity of reasoning. They concern whether one has investigated and reasoned enough, and so belong to the pragmatics of reasoning. Toulmin himself already distinguished in *The Uses of Argument* the phases in such a process of investigation (1958, pp. 15–22). Jean Goodwin has suggested, in a commentary on a version of this paper, that one could find the materials for a pragmatics of reasoning in the talk in civic debates about whether debaters have met their probative obligations.[1]

Justification is not the same as truth, or correctness. Even bad reasoning can, by a lucky chance, arrive at a correct conclusion. And even good reasoning can, by an unlucky chance, arrive at an incorrect conclusion. The reason for preferring good reasoning to bad reasoning is that, on the whole, one is more likely to arrive at the correct answer to one's question through good reasoning than through bad reasoning.

The Toulmin-type approach to the evaluation of reasoning and arguments can be usefully compared and contrasted to an approach through the concepts of argument schemes (or argumentation schemes) and their corresponding critical questions, pioneered by Arthur C. Hastings (1962) and developed among others by Keinpointner (1992), Walton (1996), Grennan (1997) and Blair (1999, 2001). An argument scheme is a general pattern of argument, e.g. from a sign to that of which it is a sign. The patterns so identified are typically so general that conformity to the pattern creates not even a presumption that the conclusion is to be accepted if there is justification for accepting the premisses. The critical questions relevant to a given argument scheme include questions about the premisses or grounds (are they true/acceptable/justified?), questions about the warrant, and questions about

[1]The preceding paragraph adapts points from Jean Goodwin's insightful commentary at a conference at McMaster University in May 2005 on a presentation of this paper; I thank her for her commentary.

defeaters, generally posed in a way that does not differentiate between these functions. As Pinto (1999) points out, an argument scheme's critical questions about the acceptability of the premiss(es) and about the truth, sufficiency or contextual appropriateness of the warrant need to be answered positively before a particular argument conforming to the scheme can be treated as one that even creates a presumption that its conclusion is to be accepted. Such critical questions ought to be, but often are not, distinguished from critical questions about exceptional circumstances in the particular case that override or undermine the inference. The Toulmin-based approach described in the present paper makes the distinction clear. The approach of the present paper is also less restrictive than most of the literature on argument schemes about the types of argument schemes (i.e. warrants) to which reasoning and arguments can be expected to conform. That is a virtue, because random sampling of argumentative texts turns up many passages that are difficult to bring under the comparatively brief list of types recognized in the argument scheme literature (Hitchcock 2002); van Eemeren and Grootendorst, for example, recognize only three main types (1992, pp. 94–102). Grennan (1997) is an exception in having a quite lengthy and systematically generated list of argument schemes, and also in acknowledging the difference between presumption-creating critical questions and presumption-defeating critical questions. The present paper also differs from the argument scheme literature in focusing on reasoning rather than argument. But all argument schemes can also be treated as reasoning schemes, as Blair (2001) for example notes.

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Chapter 24
Postscript

Abstract Relevance is the potential contribution of an item in a context to a goal or outcome. The goal may be epistemic or practical. Thus the main species of relevance are epistemic, practical and causal relevance. Premiss relevance is a species of epistemic relevance. A premiss is relevant to an argument's conclusion if and only if it can be ineliminably combined in the context with other information so as to justify or refute the argument's conclusion, provided that the other information is at least potentially accurate and its accuracy can be determined independently of the conclusion. One can combine epistemic evaluation of the components of an argument laid out on the Toulmin model with computation of defeat statuses by considering attacks on its components, attacks on those attacks, and so forth. Such methods of evaluation can be extended to complex direct arguments but not so easily to embedded indirect arguments. For the construction of arguments, something like Dewey's method of inquiry will be generally appropriate. In some but not all cases one will be able to use established warrants.

24.1 "Relevance" (1992)

"Relevance", published in 1992, is a substantially revised version of a paper presented in June 1991 at a conference at McMaster University on relevance in argumentation. The published paper sets out a comprehensive account of relevance, intended to cover all its types.

Many years later, in preparing a paper on inference claims (Hitchcock 2011), I found reason to qualify the 1992 publication's definition of premiss relevance as the ability of an argument's premiss to be ineliminably combined with other at least potentially accurate information to provide a set of premisses that is sufficient to justify the argument's conclusion (Hitchcock 1992, p. 260; p. 362 of the present volume). A counterexample to this definition, described in Hitchcock (2011), is the following argument with obviously irrelevant premisses:

(1) Napoleon ruled France; Napoleon was exiled to Elba; so Napoleon was short.

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One can produce a formally valid argument by adding to the premisses of this argument its associated material conditional, i.e. the material conditional whose antecedent is the conjunction of the premisses and whose consequent is the conclusion: 'If Napoleon ruled France and Napoleon was exiled to Elba, then Napoleon was short.' And this conditional, if interpreted as a material conditional, is actually true and known to be true: a quick check of reputable sources will tell us that it has a true consequent (Napoleon *was* short) and hence is true. To rescue the proposed account of premiss relevance, we need an account of why this formally valid expanded argument with premisses known to be true is not sufficient to justify its conclusion. On reflection, the problem appears to be that the added premiss (the material conditional associated with the original Napoleon argument) cannot be known to be true independently of knowing that the conclusion is true, so that the argument cannot produce knowledge of the truth of its conclusion. In view of this problem, the account of premiss relevance needs to be modified by requiring for relevance that one can discover that the other potentially accurate information is actually correct without assuming the truth of the argument's conclusion. On the modified account, then, a premiss is positively relevant to a conclusion for which it is offered as support if and only if there is a set of premisses that (a) when combined with the relevant premiss are sufficient to justify the conclusion, (b) are not jointly sufficient by themselves to justify the conclusion, (c) are at least potentially accurate, and (d) if accurate can be discovered to be accurate without assuming the truth of the conclusion. The word 'positively' has been added to the definiendum in order to make room for the concept of negative premiss relevance. The allowance for negatively relevant premisses implies that the definition of a premiss in the 1992 publication as "a statement presented as helping to support a conclusion" (Hitchcock 1992, p. 260; this volume, p. 362) needs to be modified by adding the phrase "or acknowledged as a consideration counting against the conclusion".

Gabbay and Woods (2003, pp. 155–156) have proposed adequacy conditions for an account of relevance. I comment below on their conditions and on whether my account meets them.

1. *Non-apocalyptic*: The account of relevance "should block the derivation of 'Nothing is relevant to anything' and of 'Everything is relevant to everything'" (p. 155). The basic idea of relevance as potential contribution in a context to some result is clearly not apocalyptic. Take any context and any result (whether an effect or an epistemic goal). Then, with rare exceptions, some things will contribute to that result in that context and some things will not. The species of relevance defined in the article (causal relevance, epistemic relevance, premiss relevance, conclusion relevance, relevance in conversation) are similarly non-apocalyptic.
2. *Context-sensitive*: The account of relevance "should acknowledge that relevance is context-sensitive" (p. 155). Context is the third term in the proposed analysis of relevance.

3. *Comparative*: The account of relevance "should provide that some things are more (or less) relevant than others" (p. 156). This adequacy condition is controversial. It is doubtful that causal relevance comes in degrees. For example, if a driver's intoxication and a slippery road surface were both contributors to a car accident, does it make sense to ask which if either was more relevant than the other? As for epistemic relevance, the proposed analysis of relevance makes room for degrees of relevance in the form of degrees of usefulness in a given context for the achievement of an epistemic goal.
4. *Possibly negative*: The account "should provide for a relation of negative relevance, distinct from the idea of irrelevance" (p. 156). We need to qualify this condition, since the distinction between positive and negative relevance applies only to epistemic relevance to a closed goal, such as justifying a conclusion or undermining an inference or proving a theorem or establishing a hypothesis. The proposed analysis does not provide for negative relevance to such goals. To allow for it, we need to redefine the relevance of an item of information in a context to a closed goal as its ability to be ineliminably combined in the context by the goal-seeker with other at least potentially accurate information so as to either achieve the goal or rule out its achievability. In the former case, the item of information is positively relevant, in the latter case negatively relevant. Otherwise it is irrelevant. This modification of the account of epistemic relevance would need to be carried through to the definitions in the chapter of relevance in conversation, premiss relevance, and conclusion relevance.
5. *Illuminating about fallacies of relevance*: The account "should help elucidate the fallacies of relevance" (p. 156). Section 22.3 of the chapter applies its account of relevance to the fallacies of relevance.
6. *Contribution to the dispute between classical and relevant logic*: The account "should make a contribution to territorial disputes between classical and relevant logic" (p. 156). This condition appears to mean that a conceptual analysis of relevance should help to determine where the boundaries lie between domains for which classical logic is appropriate and domains for which relevant logic is appropriate. The chapter gives reasons for rejecting this condition as a desideratum for a conceptual analysis of relevance. The relevance that concerns relevant logics is topical overlap between premisses and conclusion, which such logics require for entailment so as to avoid accepting the principle that anything follows from a contradiction (a principle called historically '*ex falso quodlibet*' and more recently 'the principle of explosion'). Topical overlap between a premiss and the conclusion of an argument is, as argued in the chapter, neither a necessary nor a sufficient condition for the relevance of the premiss to justifying the conclusion. Thus it is a not a kind of relevance as relevance is usually understood, and there is no reason to expect from a conceptual analysis of relevance as it is usually understood any contribution to debates about where classical logic applies and where so-called "relevant logic" applies.

7. *Contribution to a satisfactory account of belief revision*: The account "should make a contribution to a satisfactory account of belief revision" (p. 156). This condition needs clarification and motivation, which this reader was unable to find either in the section on belief (pp. 167–174) or in the pages indexed as mentioning belief revision. Gabbay and Woods evidently assume that a satisfactory account of belief revision needs to use the concept of relevance, but until we learn more about the place of that concept in such an account, there is nothing to be said about whether the present account of relevance can contribute to a satisfactory account of belief revision.
8. *Investigation of whether relevance is intrinsically dialogical*: The account "should investigate the suggestion that relevance is intrinsically a dialogical notion" (p. 156). The account under consideration did not investigate this suggestion. We need some motivation of why it should have done so, since on the face of it relevance is not intrinsically a dialogical notion. If a person is engaged in a piece of solo reasoning, for example trying to figure out the shortest route to a planned destination, some pieces of information will be relevant to their epistemic goal and others irrelevant, quite independently of any conversation with others. It would take some fancy intellectual maneuvering to make out that the relevance to the mentioned goal of a map of the area between the reasoner's present location and the planned destination is implicitly part of a dialogue. Thus the failure of the account under investigation to investigate the suggestion that relevance is intrinsically a dialogical notion does not seem to indicate an inadequacy.
9. *Providing a common analysis*: The account "should provide a common analysis of relevance" (p. 156). By a common analysis, Gabbay and Woods mean one that produces acceptable paraphrases when substituted into ordinary uses in English of the word 'relevant' and its cognates. They note that the word 'relevant' has many lexical affiliations.

> Something is relevant when it is pertinent, has to do with, has a bearing on, is important for, is involved with, is evidence for, is on-topic, [is] consequential, [is] confirming, [is] potentially falsifying, [is] significant, [is] helpful …, and [*sic*] [is] interesting. (Gabbay and Woods 2003, pp. 75–76)

   The account under present consideration was developed with attention to such ordinary uses, and as far as this writer can tell meets the condition of providing a common analysis of the concept.
10. *Able to absorb insights from alternative approaches*: The account "should be able to absorb insights from alternative approaches to relevance" (p. 156). This condition makes sense only for insights from alternative approaches that are genuinely insightful, i.e. at least partially accurate. As a partial test of whether the proposed account of relevance meets this condition, I comment below on its relation to two books that use the concept of relevance centrally: *Relevance: Communication and cognition* (Sperber and Wilson 1986) and *Agenda relevance: A study in formal pragmatics* (Gabbay and Woods 2003).

Sperber and Wilson (1986, 1987) focus on interpersonal communication. They wish to explain how human beings send and receive messages to and from one another. They claim that what they call ostensive-inferential communication is more basic than communication coded through rule-governed systems like human languages. If you are about to go outside and I point to the western sky where dark clouds are gathering, you will take me to be communicating that it is about to rain. That is ostensive-inferential communication. You have picked out from the context the piece of information that makes my pointing relevant. Although Sperber and Wilson offer no definition of relevance in their (1986), they are describing a type of epistemic relevance: in the situation described, the ostensively indicated piece of information is helpful to you in deciding whether to take an umbrella. Their insight that ostensive-inferential communication involves judgments of relevance by both sender and receiver is thus accommodated by the proposed account of relevance as potential helpfulness in a context for achieving some result.

Sperber and Wilson give a highly controversial account of the unconscious inferential process that they take to be at work in the production and receipt of ostensive-inferential communications, one that takes the relevance of an indicated piece of information to be directly proportional to the number of consequences that the receiver can deduce from it using elimination rules for logical particles and inversely proportional to the cost of drawing such consequences. Their postulation of such a central processor in the human brain is an empirical hypothesis rather than a conceptual analysis of the kind of relevance that they are trying to explain, and thus is compatible with my conceptual analysis of relevance in “Relevance”.

Gabbay and Woods (2003) develop a formal model of agenda relevance, by which they mean the relevance of a piece of information for a cognitive agent with respect to an agenda of that agent; they define a cognitive agent (p. 202) as an information-processor capable of belief. They intend their model of agenda relevance to be part of a logic of practical reasoning, i.e. reasoning about what is to be done. Their basic idea (p. 182) is that a piece of information is relevant for a cognitive agent with respect to a specified agenda of that agent if and only if in processing that information the agent is affected in ways that advance or close that agenda. An agent’s agenda is construed (p. 208) as a causal matrix of effectors jointly sufficient for an endpoint that is realizable by actions causally possible in principle for that agent, where (p. 210) the agent has an interest in the endpoint’s realization and is disposed to realize the effectors. Thus Gabbay and Woods are elaborating a kind of subjective relevance, what the agent takes (rightly or wrongly) to be helpful in the agent’s project of realizing an endpoint by means of a set of effectors that are (objectively) sufficient to bring that endpoint about. Such information will affect what the agent does, and thus is subjectively relevant to the agent’s decision-making about what to do.

To accommodate agenda relevance, the proposed account needs to be expanded to allow for a third main species in addition to causal relevance and epistemic relevance, a species that we might call ‘practical relevance’. An item of information is practically relevant in a context to deciding what is to be done if it can be combined ineliminably in that context with at least potentially accurate information

so as to result in a decision, which in the case of deciding how to achieve a goal might be a decision to abandon or modify the goal. Agenda relevance is a species of practical relevance as thus defined. It fits into the generic account of relevance as potential contribution in a context to the production of some result.

To sum up, the proposed account of relevance needs to be modified in the following respects:

1. The account of premiss relevance needs an additional clause that the potentially accurate information with which the relevant premiss can be ineliminably combined to provide sufficient grounds for justifying the conclusion can be discovered to be accurate without assuming the truth of the conclusion.
2. To accommodate negative epistemic relevance, we need to redefine the relevance of an item of information in a context to a closed epistemic goal as its ability to be ineliminably combined in the context by the goal-seeker with other at least potentially accurate information so as to either achieve the goal or rule out its achievability. Also, we need to carry through this redefinition to the species of epistemic relevance distinguished in the chapter.
3. To accommodate relevance to decision-making, we need a third main species of relevance, coordinate with causal relevance and epistemic relevance: practical relevance. An item of information is practically relevant in a context to deciding what is to be done if it can be combined ineliminably in that context with at least potentially accurate information so as to result in a decision, which in the case of deciding how to achieve a goal might be a decision to abandon or modify the goal.

These changes leave unaffected the basic idea of the proposed account that relevance is a three-term relation of potential contribution of the relevant item or factor in a context to some goal or effect.

24.2 "Good Reasoning on the Toulmin Model" (2006)

"Good reasoning on the Toulmin model" emerged from a paper presented at a conference in 2005 at McMaster University on the uses of argument, whose title echoed that of Stephen Toulmin's classic call for logic to become more empirical and more historical (1958, 2003). The paper was published in revised form as an article in a special issue of the journal *Argumentation* (vol. 13, no. 3) on the Toulmin model for the layout of arguments. That article in turn formed the chapter in the volume of new essays in argument analysis and evaluation entitled *Arguing on the Toulmin model* (Hitchcock and Verheij 2006) that is the version reprinted in the present collection.

The chapter is complementary to an article by Bart Verheij published in the same special issue and same volume of essays (Verheij 2005, 2006), on evaluating arguments based on Toulmin's scheme. Both articles propose a method of evaluation for reasoning or argument laid out according to Toulmin's model. Verheij

reconstructs the model in terms of his theory of dialectical arguments, so as to allow for attacks on components. Thus he provides a method of formally evaluating the status of the components of an argument laid out in Toulmin's fashion in the light of attacks on those components, attacks on their attackers, and so on. My article takes an epistemological rather than a dialectical approach to evaluation within a Toulmin-type analysis, and applies it to solo reasoning rather than to argument directed at others. It could be combined with Verheij's attention to the defeat status of components of the Toulmin model by allowing for consideration of attacks on those components, attacks on the attackers, and so on.

A limitation of both articles is that they consider only single-inference reasoning and argument, in which a single claim is supported by a set of grounds, for none of which supporting reasons are offered. (Verheij allows for indefinite complexity in the form of attacks and attacks on attackers, but not for complexity in support structures.) However, the approach of my chapter to good reasoning can be extended to chains of reasoning, since it allows that a premiss can be justified by previous good reasoning or argument. It is more difficult to extend the approach to embedded reasoning, from which one or more premisses are discharged in accordance with such rules as conditional elimination, disjunction elimination (proof by cases) or reductio ad absurdum. In fact, it is hard to see how such forms of reasoning could be laid out on the Toulmin model.

My chapter is largely independent of the specifics of the Toulmin model. Its criteria for justified grounds constitute an epistemological account of premiss adequacy, applicable to the ultimate premisses of any reasoning with a goal of arriving at a correct conclusion. And its requirement of a justified general warrant could be reformulated, in an approach that reconstructs reasoning as formally or quasi-formally valid, as a desideratum for attributed unexpressed premisses.

The approach of the chapter can also be extended to the evaluation of arguments from an epistemological perspective. It does not apply directly to the evaluation of arguments from a dialectical perspective that takes acceptance by an interlocutor as the touchstone of good argument or from a rhetorical perspective that takes adherence of targeted addressees as the touchstone.

The chapter's criteria for evaluating reasoning laid out on the Toulmin model are not really helpful to someone trying to reason things through for themselves. The criteria suppose a piece of reasoning that is already completed and is being reflectively checked for its quality. If we are beginning to reason about some topic, we generally do not begin with ultimate premisses that can be checked for accuracy, and only then cast about for a justified general warrant that would license inference to some conclusion. We generally start with an issue or question on which we wish to work out a good answer. John Dewey gives two good examples of such questions in his classic work on critical thinking as an educational ideal, *How We Think* (Dewey 1910). One example is a practical question: How can I best get to a desired destination in Chicago by a desired time? The other is theoretical: When I wash a glass in hot water and set it upside down on the counter, why does the water that drains from the glass form bubbles? Dewey's illustrations of the reasoning involved in answering such questions are essentially hypothetico-deductive. One thinks of

various possible answers to the question, explores their implications, and eventually arrives at one hypothesis that survives scrutiny while the others fail.

Toulmin himself did not suppose that inquiry of the type illustrated by Dewey's examples generally proceeded by constructing arguments that could be laid out on his model.

> We are not in general concerned in these essays with the ways in which we in fact get to our conclusion, or with methods of improving our efficiency as conclusion-getters. It may well be, where a problem is a matter for calculation, that the stages in the argument we present in justification of our conclusion are the same as those we went through in getting at the answer, but this will not in general be so. (Toulmin 1958, p. 17, 2003, p. 17)

One can use the Toulmin model as a frame for certain sorts of conclusion-getting. These are inquiries where the governing problem takes us to a field of inquiry where we can find established warrants for drawing conclusions on our sort of problem. If the question is the market value of a piece of real estate at a certain time, we can go to the field of real estate appraisal for established methods of estimating market value. If the question is the efficacy of a new drug proposed as a treatment for some illness, we can consult the methodology of conducting randomized controlled trials for guidance on how to answer the question. To put such inquiries in Toulminian language, we could say that we go from a problem to the warrants that would license an answer to our problem if we had the relevant data, and then to a plan for gathering the data that we need, a plan which we then implement and whose results we use with the help of our warrant(s) to draw a conclusion that is the answer to our question. For some inquiries, we may need to make a selection of the field in which to select our warrants, a selection that Goodnight (2006) has argued requires for its defence a "legitimation inference".

The criteria for justified grounds synthesize empirical and philosophical work by others on observation and memory. They indicate the interdisciplinary character of much scholarly work on reasoning and argument. This work is interdisciplinary rather than transdisciplinary; the disciplines in which the empirical results on which I rely were obtained have their own integrity of methods and standards.

The criteria for justified grounds deal with the same problem from the same epistemological perspective as Freeman's *Acceptable premises* (2005). Freeman's approach is broader, in that it considers premisses of all types, not just the descriptive premisses on which my chapter focuses but also evaluative and prescriptive premisses. It focuses on argument rather than on reasoning, but on argument directed at justification of its conclusion. Thus, although both essays consider how an ultimate premiss in some reasoning can be adequate if the reasoning is to justify the conclusion drawn, Freeman adds the dialectical component of challengers assessing premiss acceptability on the basis of their own background information. Freeman's basic idea is that an ultimate premiss is adequate if there is an undefeated presumption in its favour. To determine whether there is a presumption in favour of a statement, one classifies the statement and the source that vouches for it, then determines whether this voucher creates a presumption for that type of statement (Freeman 2005, p. 320). A statement is to be classified according

to the type of source whose vouching creates a presumption in its favour. There is a presumption in favour of necessary statements if they are vouched for by a priori intuition, in favour of descriptive statements if they are vouched for by perception or memory or introspection, in favour of interpretations if they are vouched for by physical or personal or institutional intuition as appropriate, and in favour of evaluations if they are vouched for by intuitions of intrinsic or deontic or aretaic value as appropriate. Freeman's approach, which he calls "commonsense foundationalism" (2005, p. 367) is more comprehensive than the approach of my chapter and more explicitly connected to work in analytic epistemology and its philosophical forebears, but less detailed in the areas where our two essays overlap. I personally see no inconsistency between them.

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Part VI
Fallacies

Chapter 25
Do the Fallacies Have a Place in the Teaching of Reasoning Skills or Critical Thinking?

Abstract The case for including fallacies in teaching critical thinking is weaker than it seems. Further, there are at least four arguments against using fallacies as a framework for teaching critical thinking. Empirical research is needed to determine what kinds of mistakes in reasoning occur most commonly in arguments and what effect teaching the fallacies has on critical thinking dispositions and skills.

> The fallacies generally turn out not to be fallacies—unless one builds into the identification process, and hence into the labels, all the skills needed for analysis without the taxonomy of fallacies. In that case one has made it a formal approach, and the encoding (i.e. diagnosing) step has become the tricky one. (Scriven 1976, p. xvi)

Almost two decades ago, at the end of a course in introductory symbolic logic, I turned to a section of the text which dealt with informal fallacies. The students' interest immediately rose. Here were passages of prose recognizably like the things they were used to hearing and reading, and it was great fun to label the commonly made mistakes. Unlike the meaningless letters and novel symbols of the propositional and first-order predicate calculus, these exercises had obvious application to everyday life.

When it came time to discuss examples and grade exercises, however, the attractiveness of this approach began to fade. For any passage, students produced more than one fallacy label for a single mistake. Worse, I was unable to work out which of the labels was correct; the types of fallacies recognized in our taxonomy were apparently not mutually exclusive. Worse still, when I included on a test some passages which contained no fallacies at all, students unhesitatingly identified the fallacy and were able to argue just as convincingly for its presence as in the case of the truly fallacious passages. Students were apparently able (and willing) to find a fallacy in anything.

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In the light of this experience, in my teaching of critical thinking, I have chosen texts (Scriven 1976; Hitchcock 1983; Fisher 1988; Govier 1992) that contained almost no mention of fallacies and have avoided explicit teaching of fallacies, though occasionally some appeared as privations of desirable criteria of good arguments.

Having been asked to discuss whether the fallacies have a place in the teaching of reasoning skills/critical thinking, I must now re-examine my scepticism about the value of a fallacies approach. I begin (Sect. 25.1) with some remarks about what we are trying to teach when we teach reasoning skills/critical thinking. Since to many people it seems obvious that the fallacies have a place in teaching critical thinking, I begin my consideration of the place of fallacies by articulating the most obvious argument for their inclusion (Sect. 25.2) and revealing its weaknesses. The weaknesses of the case for including the fallacies lead naturally to some direct arguments against including them (Sect. 25.3). I conclude (Sect. 25.4) by indicating open questions that deserve further research.

25.1 Critical Thinking as an Educational Goal

In teaching students to think critically, we are trying not only to impart knowledge and improve skills but also to foster a critical spirit, one that examines the credentials of the intellectual products (e.g. arguments, statements, questions, experimental designs, hypotheses) it encounters (including one's own products) rather than accepting them blindly or following pre-conceived prejudices (Glaser 1941; Paul 1982; Siegel 1988; Ennis 1991). People who have learned to think critically tend to apply the standards of reason to all intellectual products they encounter, their own as well as other people's, the conclusions they agree with as well as those they dissent from or are uncertain about. The disposition of a critical thinker is not merely a disposition to suspend judgment. On the contrary, a critical thinker will make judgments when the evidence and argument warrant making them in a particular pragmatic context; she is in Ennis's words (1985, p. 45) "focused on deciding what to believe or do". When teaching critical thinking, therefore, we do not want to inculcate a disposition to find all arguments and evidence inadequate. Critical thinking need not be negative thinking; it should have an element of appreciation, like art or film or literary criticism, rather than resembling the judging involved in convicting and sentencing criminals.

Thus the following features of critical thinking are relevant to the question of whether there is a place for the fallacies in teaching critical thinking:

1. The goal of teaching critical thinking is to foster a balanced disposition to appraise intellectual products, not a disposition to look for mistakes.
2. Although critical thinking involves appraisal, it includes appraisal of one's own mental products as part of an ongoing process of inquiry, and is in this sense constructive.

3. Whether applied to one's own thinking or others', critical thinking should sometimes result in a judgment that the intellectual product under examination is acceptable.

25.2 The Case for Fallacies

At first glance, it seems obvious that there is a place for fallacies in teaching critical thinking. If fallacies are, as is commonly thought, common mistakes in reasoning that often deceive both those who commit them and those to whom arguments are directed, then those who are teaching students to monitor intellectual products for acceptability should transmit humanity's acquired knowledge of what the most common mistakes are and develop the ability and disposition to recognize them and respond appropriately. A student who is taught, for example, the concept of a biased sample and given practice and feedback on recognizing and commenting appropriately on systematic bias in the selection of samples should be more likely to recognize such bias in the future than if she is not taught the concept or given the practice. In this respect, then, she will be better at monitoring intellectual products for acceptability—better at critical thinking. If she undertakes some sample-based research of her own, she is likely to be more sensitized than otherwise to the importance of avoiding systematic bias in the sampling procedure. Similarly for other fallacies—straw man, begging the question, missing the point (*ignoratio elenchi*), post hoc.

This argument, which I hope is a plausible conjecture about the thinking of those who defend a fallacies approach, is not as compelling as it first seems to be.

To begin with, its appeal to tradition is weak. Many pieces of lore are handed down in a society simply because they got there once in some fortuitous way and have been repeated. Think for example of the belief in medicine of the efficacy of blood-letting, or any number of popular superstitions. The fallacies tradition, as Hamblin (1970) has shown, is an unsystematic accretion developed from Aristotle's listing of the tricks used by quarrelsome debaters in a stylized form of antagonistic question-and-answer discussion known as *elenchus* or refutation. Aristotle's list includes tricks peculiar to this type of discussion (e.g. many questions) or peculiar to the Greek language (e.g. accent), which are of little relevance to the exercise of critical thinking in the late twentieth century. Over the centuries, this or that textbook has introduced this or that innovation without much justifying support. Textbooks repeat what previous textbooks include, and the resulting mishmash is "so incoherent that we have every reason to look for some enlightenment at its historical source" (Hamblin 1970, p. 50).

Setting aside the appeal to tradition, do fallacies in fact occur? More than one contemporary philosopher has argued that they do not. Massey (1975, 1980) points out that one cannot condemn an argument on the basis that it commits a formal fallacy like denying the antecedent or affirming the consequent, because not all arguments which have an invalid form are invalid; in fact, all valid arguments are of

the invalid form "p_1, …, p_n, therefore q". In the absence of a systematic theory of the grammar of natural languages, we cannot prove that an argument in a natural language is of no valid form; the only way to prove invalidity, according to Massey, is to show that in fact the premisses are true and the conclusion is false. George (1983) objects that we can recognize "the form" of natural-language arguments. Govier's remark that "formal proofs of invalidity are sometimes possible, given the correctness of necessary preformal assumptions" (1987, p. 189) indicates the limits of such proofs of invalidity.

Massey's argument applies only to formal fallacies. Finocchiaro (1981) complements it by appealing to the paucity of real examples in textbook treatments of informal fallacies and the poor interpretation of the few real examples which do occur. He concludes that "there are probably no common errors in reasoning. That is, logically incorrect arguments may be common, but common types of logically incorrect arguments probably are not" (Finocchiaro 1981, p. 15). Govier (1987, pp. 190–197) rightly criticizes Finocchiaro's conclusion as hasty, pointing out that a competing plausible explanation of the poverty of the textbook treatments is the disinclination of philosophers to do empirical research. In an interesting twist, she also attempts to use Finocchiaro's argument against itself, since (she claims) it implies that logic texts often commit the straw man fallacy—namely, by unjustly or uncharitably interpreting as fallacious the few real-life examples they do discuss. But on Govier's own account (1992, p. 157) the straw man fallacy consists in claiming to have refuted a position on the basis of a misrepresentation of it; the poor interpretations in the logic texts don't refute the arguments they stigmatize as fallacious, but expose an alleged flaw in them.

Govier's critique, then, does not establish that Finocchiaro is mistaken, only that he has not proved his point. There is considerable psychological research on the kinds of mistakes in reasoning (especially conditional, inductive and statistical reasoning) that people systematically make (Nisbett and Ross 1980; Kahneman et al. 1982). But the inductive "mistakes" identified in such research are according to Cohen (1982) defensible on the Baconian approach to induction, for which he argues. Furthermore, since these are mistakes identified in experimental tasks, they may or may not show up in the arguments people deploy in real-life situations.

We are left, it seems, with impressionistic conjecture. Let me report my own conjecture: Most of the fallacies in the traditional list are not very common occurrences. But some are. Thus, in debating contexts, various kinds of questionable diversionary tactics are common: attacking the person, attacking a straw man, arguing for an irrelevant (or at least a different) conclusion, begging the question at issue, using loaded terminology. In monological arguments we often find biased sample, hasty generalization, failure to consider alternative explanations (hasty

conclusion), and suppressed evidence. In reasoning by ourselves we are likely to exhibit confirmation bias, the Concorde fallacy, the gambler's fallacy and Monday-morning quarterbacking.[1] Some of these fallacies are peculiar to the contexts in which they usually occur. Confirmation bias, for example, does not show up in arguments produced as a result of it, even in the form of suppressed evidence, since the arguer is not so much suppressing evidence as reporting the outcome of an inquiry strategy which makes it likely that she will not come across any evidence that needs to be suppressed.

The most readily identifiable kinds of deception in everyday discourse, however, are not mistakes in reasoning, but misleading presentations of information. The so-called "gee-whiz graph" (Huff 1954) exaggerates the amount of a change, for example in the value of some currency, by putting the *x*-axis at something other than zero; a minor perturbation can in this way be made to look like a catastrophic fall or a booming surge. What I have called the "dangling relative" (Hitchcock 1983) occurs in advertisements that trumpet "50% off" without specifying the price from which the 50% has been taken.

Even if we concede that fallacies do occur—that is, that there are recurring types of mistakes in reasoning which tend to deceive the consumers of arguments—it is not obvious that the best way to teach people to avoid committing them and to respond appropriately when others make them is to teach a list of mistakes and provide practice with examples. This is like saying that the best way to teach somebody to play tennis without making the common mistakes (and to recognize these mistakes in others' play) is to demonstrate these faults in action and get him to label and respond to them. Rational inquiry and arguing a case, like playing tennis, are complex skills, where the mistakes are deviations from doing it correctly. What the tennis coach teaches is how to do it correctly. Then the coach watches the learner, and corrects the mistakes peculiar to that learner. In teaching critical thinking, then, one should teach the rules of good reasoning, and draw the learner's attention to those mistakes that she actually commits. Like a good tennis player or a good dancer, a good reasoner can recognize mistakes in performance and characterize them appropriately without having been taught a list of common mistakes. Knowing how to reason well, a good reasoner will recognize when some requirement of good reasoning is not satisfied.

[1]Confirmation bias involves looking only for evidence which supports a hypothesis one is investigating, thus ignoring any disconfirming evidence which may exist. The Concorde fallacy is the assumption that the amount of time and money one has already invested in an option gives one some reason to continue pursuing that option. The gambler's fallacy is thinking that past results in a sequence of independent chance events affect the probability of the next event in the sequence. Monday-morning quarterbacking evaluates the merits of a decision under uncertainty or risk on the basis of what the outcome turned out to be rather than on what the decision-maker could reasonably be expected to know at the time of making the decision.

25.3 The Case Against Fallacies

The case for fallacies, obvious as it seems, has turned out to be weak. A sustained critique of this argument has left us with the suggestion that in teaching critical thinking the fallacies are a diagnostic tool for pointing out to learners the mistakes they are habitually committing.

The weaknesses of the case for including the fallacies can be supplemented by a number of reasons for hesitating to include them. These reasons apply particularly to approaches to teaching critical thinking that use the fallacies as a framework (e.g. Kahane 1992; Johnson and Blair 1993).

First, the correct identification of an argumentative move as a fallacy, as Scriven observed in the passage quoted at the beginning of this chapter, requires a complex apparatus of analysis. In some cases, such as the various fallacies of irrelevant appeal (*ad populum*, ad hominem, *ad verecundiam*), one needs to deploy a fairly sophisticated conception of when the generic move involved is legitimate in order to be able to tell that a particular case is illegitimate; it is only "irrelevant" appeals to popularity, to the person or to authority that are fallacious, and the criteria for irrelevance are complex and tricky to apply. In other cases, such as begging the question or biased sample, the move is always illegitimate but one needs to deploy a sophisticated conception of when it takes place, a conception that involves implicitly characterizing the contrast concept (justification without assuming the truth of the conclusion, sampling from the target population by one of a number of methods not systematically biased). In either case, it makes more sense to teach the analytical apparatus for correct reasoning (and to let the fallacy fall out as a kind of deviation) than to begin with the fallacies.

Second, fallacy labels are not necessary to the exercise of critical thinking; everything that can be said with the use of these labels can be said without them, and in general said more clearly. The labels have not become part of our everyday vocabulary; they have the flavour of the academic world about them, and must be explained when used outside an academic context. Such an explanation was necessary, for example, when a panelist on a Canadian radio broadcast on 2 October 1992 wondered whether commentators were committing a post hoc fallacy in blaming the prime minister's dramatic tearing up of a recently negotiated constitutional accord for a drop in the value of the Canadian dollar and resulting rise in interest rates. The fallacy of begging the question is so far from the consciousness of educated people today that they use the expression "beg the question" most commonly to mean "raise the question". Such people may nevertheless be quite capable of recognizing and dealing with the illegitimate assumption in debate of the point at issue. Perhaps for this reason Ennis in his most recent taxonomy of the abilities of the ideal critical thinker (1991) lists employing and reacting to fallacy labels in an appropriate manner as "*auxiliary critical thinking abilities*—having them is not constitutive of being a critical thinker" (p. 9, his italics).

Third, a fallacies approach is unduly negative. It fosters an attitude of looking for the mistake, and of stopping once one has found something one can pin a fallacy

label on, rather than coming to grips with the substance of what one is discussing. Most arguments are neither ironclad proofs nor a tissue of error; their appraisal requires a careful, just and even sympathetic working through of the argument. Teaching students to look for mistakes that they can label is not likely to promote that kind of approach. It is likely to promote the attitude of a "hanging judge" who looks for a basis on which to convict and sentence accused persons, rather than the attitude of a film critic who appreciates the merits of the films she watches.

Fourth, learning the fallacies is of no help in learning to construct good arguments of one's own, and of little help in learning to appreciate the merits of good arguments—both of which, I have urged, are components of critical thinking. By contrast, learning to construct good arguments or at least to appreciate the merits of good arguments is of great help in learning to recognize and respond to mistakes in reasoning. Using fallacies as a framework for teaching critical thinking draws upon and encourages our sense that we are besieged by persuasive appeals which are subtly deceptive. It is pleasing, particularly to young people beginning to think for themselves, to have an arsenal of labels with which to reject attempts of their elders to stampede them into a certain way of thinking. Pleasing as it is, however, the "pin the fallacy on the argument" game is a childish sport that does not conduce to an adult appreciation of the strengths and weaknesses of the intellectual products presented to us for our acceptance.

25.4 Open Questions

I have articulated my scepticism about giving a large role to the fallacies in teaching critical thinking. I have pointed out weaknesses in the obvious argument for including them. And I have given some reasons for excluding them, or at least for not taking a fallacies approach to teaching critical thinking.

These arguments, however, have suffered from the lack of good relevant empirical research. Here are two questions such research could answer.

First, *What kinds of mistakes in reasoning occur commonly in arguments*? To undertake this research requires at least a preliminary list of purported fallacies, perhaps culled from the literature. This list should be subject to revision in the light of the critical examination of a large selection of argumentative texts culled in some unbiased way from the full range of contexts in which arguments occur. Such a corpus would be a useful object of study for other empirical investigations of argument, and might deserve publication in its own right. Since even the most common fallacies might occur only once in a hundred arguments, the number of passages requiring examination would be very large.

Second, *What effect does teaching the fallacies have on the development of critical thinking dispositions and skills*? The Educational Resources Information Center (ERIC) lists no publications on this topic under the intersection of "fallacies" with "logic" or "informal logic" or "critical thinking". We need a controlled study of the differential effects of various approaches to teaching critical thinking: a

fallacies approach that takes the fallacies as the framework (e.g. Kahane 1992; Johnson and Blair 1993), a multifaceted approach in which the fallacies are a section of a course (e.g. Copi and Cohen 1990), an integrated infusion approach in which the fallacies appear as privations of one or other criterion of a good argument (e.g. Govier 1992), a positive approach in which the fallacies are hardly mentioned (e.g. Scriven 1976; Hitchcock 1983), and perhaps others. Such a study should compare the outcomes, not on a standard examination that students take for credit (since such an examination would have a strong steering effect which would mask differences in learning) but on a valid measure of critical thinking dispositions and skills.

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Chapter 26
Is There an *Argumentum ad Hominem* Fallacy?

Abstract If we understand a fallacy as a mistake in reasoning that occurs with some frequency in real arguments and is characteristically deceptive, there is no *argumentum ad hominem* fallacy. Arguing ad hominem in its original sense is a perfectly legitimate strategy of using an interlocutor's concessions or commitments to show that the interlocutor is committed to a certain conclusion. The *tu quoque*, which emerged from this sense as an appeal to commitments implicit in the behaviour of one's critic, legitimately challenges the critic to explain away an apparent inconsistency. The purely abusive ad hominem is either a legitimate attack on an opponent's ethos or an objectionable diversionary tactic that is not a kind of reasoning. The circumstantial ad hominem, which attributes the position of one's opponent to self-interest or a dogmatic bias, raises legitimate suspicion about the credibility of the opponent's statements and arguments.

In *Logical self-defense* (1977, 1983, 1993), Johnson and Blair treat the ad hominem as a fallacy of diversion, a response to a person's argument by an irrelevant attack on the person. They acknowledge the difficulty of coming up with a principle indicating when such a personal attack is relevant, and thus not fallacious. As a safeguard, they require in the third edition the ability to show that the personal attack is irrelevant to assessment of the person's argument. In all three editions, they cite three cases where an attack on a person would clearly be legitimate: appeals to authority or expert opinion, candidates for positions of public trust, and credibility of a statement made on a person's say-so.

Johnson and Blair's treatment of the ad hominem fallacy is standard. It is similar, for example, to that of the most popular contemporary introductions to logic (Hurley 2003, pp. 118–121, Copi and Cohen 2002, pp. 143–145). In fact, their treatment is in many respects superior to that of their competitors. They recognize, as others do not, that not all personal attacks in response to an argument are irrelevant to the assessment of that argument. They discuss the fallacy with refer-

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ence to real quoted examples, not invented or doctored ones, for which they give a specific reference that can be traced. And their discussion of each example is nuanced. It proceeds in two parts, the first showing that the example is a personal attack and the second considering whether the attack is relevant, an issue on which they sometimes express agnosticism.

Despite this care and subtlety, they do not succeed in showing that there is an ad hominem fallacy. In fact, I shall argue, there is no such fallacy.

What is a fallacy? Trudy Govier nicely sums up the standard conception of a fallacy in the western logical tradition, as follows: "By definition, a fallacy is a mistake in reasoning, a mistake which occurs with some frequency in real arguments and which is characteristically deceptive." (Govier 1995, p. 172) If there is an ad hominem fallacy, it should be a move in argument or reasoning. Further, it should be always mistaken. Further, it should occur with some frequency in real arguments. A mistake in an unrealistic invention of a logic textbook writer, designed to fit the textbook's theory, does not amount to a fallacy, for a mistake is not a fallacy unless people actually make it. To support a claim that a certain mistake is a fallacy, one therefore needs to point to actual examples, and one's analysis of these examples as committing the mistake needs to be defensible, i.e. accurate and fair. Further, one needs to show that people are taken in by this mistake; thus, sophisms that would fool nobody are not fallacies.

Contrapositively, to show that a certain move is not a fallacy, one needs to show only that one of the necessary conditions for fallaciousness is lacking. Perhaps the move is not even a way of reasoning or arguing. Perhaps it is not a mistake, or not always a mistake. Perhaps people do not actually make this move in real arguments, at least not with enough frequency to deserve the invention of a label and a listing in the pantheon of logical fallacies. Or, if the move does occur with some frequency, perhaps it is so patently absurd that it would not fool anybody with even a minimum of logical acuity.

The reasons for the non-fallaciousness of the *argumentum ad hominem* vary from one species to another. I shall therefore consider each species separately, in each case giving some historical background.

26.1 The Traditional Sense of the ad Hominem

In western thought, to argue ad hominem (Greek *pros ton anthrōpon*) originally meant to use the concessions of an interlocutor as a basis for drawing a conclusion, thus forcing the interlocutor either to accept the conclusion or to retract a concession or to challenge the inference. Aristotle in his discussion of the principle of non-contradiction distinguishes "absolute proof" (*haplōs apodeixis*) from "proof relative to this person" (*pros tonde apodeixis*, *Metaphysics* [1957] XI.5.1062a3). In his influential 13th century commentary on this work (*Lectio* V. n. 2213, 2219, 2222; cited in Nuchelmans [1993, p. 40, n. 9]), Thomas Aquinas uses the corresponding Latin phrase *demonstratio ad hominem* for relative proofs of first

principles. By the 17th century, logic textbooks were using the phrases "*argumentum ad hominem*" and "*argumentatio ad hominem*" quite generally for arguing about any subject-matter at all from the concessions of one's interlocutor, a usage attested as a scholastic commonplace (Nuchelmans 1993, p. 41); Galileo uses the expression "ad hominem" for an argument whose author derives a conclusion not acceptable to an opponent from premisses accepted by or acceptable to the opponent but not the arguer (Finocchiaro 1973–74). Locke is referring to this background when he reports in his *Essay Concerning Human Understanding* (1689) that "to press a man with consequences drawn from his own principles or concessions … is already known under the name of *argumentum ad hominem*" (Locke 1959/1689, p. 278; IV.XVII.21).

Arguing ad hominem in this traditional sense is simply dialectical reasoning, reasoning from the commitments or concessions of an interlocutor. It is not in itself mistaken, merely of limited probative value. One would make a mistake in reasoning if one represented such an argument ad hominem as an absolute proof of its conclusion. And in fact this misrepresentation is how Whately (1827/1826) defines the ad hominem fallacy–apparently the first time in a logical tradition going back more than 23 centuries that arguing ad hominem was stigmatized as fallacious. A fallacy is committed, Whately claims, if (and apparently only if) an *argumentum ad hominem* is presented as having established the conclusion absolutely, rather than merely as one that the individual referred to is bound to admit.

In this whole tradition, which continued in logic textbooks of the 18th and 19th century (Nuchelmans 1993), there is not a hint that an *argumentum ad hominem* is a personal attack. It is not an argument *against* the opponent, but an argument *to* the opponent, i.e. to the commitments already made by the opponent, whether by unprompted assertion or by concession in response to a question or by mode of conduct. It is a perfectly legitimate way for a proponent to get the opponent to accept the consequences of those commitments, even if the proponent does not share them. It can go wrong, as can any legitimate form of argument. The attribution of a commitment may be inaccurate, its alleged consequence may not in fact follow, the proponent may claim to have proved the conclusion to someone other than the opponent. But those mistakes are not ad hominem fallacies. They are mistakes in the use of a basically legitimate form of argument, the *argumentum ad hominem* in its Lockean sense. The mistakes might be labeled faulty premiss, non sequitur and illicit *metabasis* (Parry and Hacker 1991).

26.2 The *Tu Quoque*

Two writers from the early 19th century testify to a further broadening of the phrase "*argumentum ad hominem*" to cover arguments from the conduct or character of one's opponent. In his 1826 *Elements of logic*, Whately represents unnamed "logical writers" as describing the *argumentum ad hominem* in "lax and popular language" as "addressed to the peculiar circumstances, character, avowed opinions,

or past conduct of the individual", and as thus referring to him only and not bearing directly and absolutely on the real question (Whately 1827/1826, p. 191). Schopenhauer (1951/ca. 1826–1831), writing at about the same time, extends the concept of a proof ad hominem to proof from an opponent's actions. Such a proof points out an apparent inconsistency between present words and previous deeds, as in Whately's famous sportsman's rejoinder: A sportsman accused of barbarity in killing unoffending hares or trout for his amusement "not unjustly" shifts the burden of proof to the accusers with the rejoinder, "Why do you feed on the flesh of animals?" (Whately 1827/1826, p. 192) The rejoinder establishes a presumption that the accusers are bound by their flesh-eating conduct to admit that there is nothing wrong with killing unoffending animals for sport. With the presumption established, the flesh-eating critics must now establish a relevant difference between killing animals for food and killing them for sport.

In its use to turn an opponent's criticism on himself, this form of argument appears in 21st century logic textbooks as the "*tu quoque*" (you too). It can be deployed erroneously, for example by misdescribing the past actions of one's critic, alleging an inconsistency where there is none, or representing the opponent's proposition as refuted absolutely when it is in fact refuted only ad hominem. But these mistakes are ways in which a perfectly legitimate form of argument can be manipulated. Properly used, the *tu quoque* puts a burden on a critic to explain away an apparent inconsistency between word and deed.

Contemporary textbooks that classify the *tu quoque* as a fallacy describe a theoretical mistake that real arguments do not commit, and massage or misinterpret their examples to fit their theory. Johnson and Blair use a criticism of government ministers in Canada who exhorted Canadians to spend winter holidays at home in Canada but spent their own winter vacations in Florida and the Caribbean (Govier 1981, p. 2; cited in Johnson and Blair 1993, p. 74). They treat this passage as mistakenly claiming that the failure of the officials to act on their own arguments invalidates or detracts from their arguments. Similarly Hurley (2003, p. 119) treats a *tu quoque* as an attempt to show that the opponent's premisses do not support the opponent's conclusion. Copi and Cohen (2002, p. 144) treat it as mistakenly taking the fact that the opponent's actions imply some proposition (here, that it is fine to vacation outside Canada) as a reason for thinking that the proposition is true. None of these analyses is a particularly plausible construal of Govier's example. As Govier herself remarks, "Somehow, one feels, critics of government ministers have got some kind of valid point here." (Govier 1981, p. 2)

The inadequacy of the textbooks' analyses comes out clearly when one looks at quoted instances of the *tu quoque*, such as the following passage quoted by Engel:

> I am a Newfoundlander, and I cannot help but feel some animosity toward those people who approach the seal hunt issue from a purely emotional stance. Surely this is not the way they look in their butcher's freezer, when they are looking for pork chops. Yet the slaughtering method approved by the Department of Health officials for swine is hideous, and nowhere near as humane as the dispatching of a young seal (Engel 1994, p. 31).

This passage is a *tu quoque* addressed to a third party: it alleges that the critics of the seal hunt support even less humane means of killing animals, by eating pork. The Johnson–Blair–Hurley analysis does not fit, since there is no reference to the emotional critics' arguments, and so no claim that the critics' inconsistency invalidates their arguments. Nor does the Copi–Cohen analysis fit, since the author does not take the critics' inconsistency to establish that the seal hunt should be allowed, but rather uses it to explain his animosity towards them. The appeal to apparent inconsistency has exactly the same function as Whately's sportsman's rejoinder: it puts the critics on the defensive, forcing them to explain their apparent inconsistency.

26.3 The Abusive ad Hominem

The abusive *argumentum ad hominem* emerged from an amalgamation of traditions stemming from two remarks of Aristotle.

In his *Sophistical Refutations* Aristotle distinguishes two ways in which one may "solve" a fallacious argument. The proper way is relative to the argument (*pros ton logon*, 1950; 177b34, 178b17): the solution will work for all instances of the fallacy and is independent of the particular commitments of the argument's author. To depend on the author granting some proposition is to propose "a solution relative to the man" (*lusis pros ton anthrôpon*, 178b17), a phrase Latinized by Boethius as "solutio ad hominem". Apparently following Boethius, logical treatises of the 13th century use "solutio ad hominem" for a pseudo-solution of a fallacy that attacks the questioner instead of his faulty argument (Nuchelmans 1993, p. 43).

In his *Rhetoric* Aristotle complains that writers of rhetorical handbooks in his day paid no attention to its subject-matter, persuasion, but focused on accessories "outside the thing" (*exô tou pragmatos*, 1959, I.1.1354a15–16). Appropriating this notion, later ancient rhetorical writers identified one such feature as the person of the disputant, thus setting up a contrast between the person or man (Latin *persona, homo*) and the business or cause or thing (Latin *negotium, causa, res*) (Nuchelmans 1993, pp. 43–44). Features of a speech that concern the personal characteristics of one's opponent were generally respectable, as long as they were effective in persuading the audience. The rhetorical *ad personam* or *ad hominem* would typically appear in the refutation section of a speech (Latin *refutatio, confutatio, solutio*) after one's proof, in which case it could be given the name "*solutio ad hominem*".

The dialectical and the rhetorical *solutio ad hominem* came together in a number of logical treatises of the 15th and 16th centuries. The *solutio ad rem*, characterized as a genuine refutation of a bad argument, was contrasted to a *solutio ad hominem*, which could consist either in repelling an adversary (whether by making a counter-charge or by arguing that it was inappropriate for him to utter his accusation) or in trivializing the offence with which one was charged or in inserting a digression. These treatises tended to disparage such devices as not belonging to logic, though it did not stigmatize them as fallacies (Nuchelmans 1993, pp. 44–46).

In the first half of the 20th century introductory logic textbooks (e.g. Joseph 1906; Sellars 1917; Cohen and Nagel 1934; Beardsley 1950; Copi 1953) began to use the phrase *argumentum ad hominem* not in Locke's and Whately's dialectical sense of arguing from an opponent's concessions or other commitments, but in the rhetorician's sense of a response to an opponent with a personal attack, and to stigmatize it as a fallacy. This shift appears to have happened by means of a slide from Whately's (1827/1826) extended sense of *argumentum ad hominem*. The *argumentum ad hominem* appears in the plural in Augustus De Morgan's *Formal logic*, which was first published in 1847, accompanied by the claim that *argumenta ad hominem* generally commit the fallacy of *ignoratio elenchi*, characterized as answering to the wrong point (De Morgan 1847, pp. 308–309). De Morgan describes *argumenta ad hominem* as arguments with some reference to the person to whom the argument is addressed, a loose characterization that covers both arguments *ex concessis* and personal attack arguments. It is noteworthy that he does not claim that an *argumentum ad hominem* is in itself a fallacy, only that in context it generally commits the fallacy of answering to the wrong point. As species of *argumenta ad hominem* De Morgan mentions recrimination, charge of inconsistency and parallel cases—the latter illustrated by Whately's sportsman's rejoinder, which De Morgan argues is not really a parallel case. Jevons (1882, pp. 178–179) simplifies De Morgan's claim by classifying the *argumentum ad hominem*, defined as "an argument which rests, not upon the merit of the case, but the character or position of those engaged in it", as in itself a species of irrelevant conclusion, which "consists in arguing to the wrong point, or proving one thing in such a manner that it is supposed to be something else that is proved". He gives as examples the barrister following the solicitor's advice, "No case; abuse the plaintiff's attorney"; a man accused of a crime saying that the prosecutor is as bad; and an argument that the proposer in Parliament of a change in the law is not the man to bring it forward. Thus the shift from the traditional dialectical sense of *argumentum ad hominem* to the contemporary abusive sense is complete.

Some textbooks, including Johnson and Blair's (1977) and (1983), identify the move of responding to a statement or argument with a personal attack with the ad hominem. Others, including Johnson and Blair's (1993), call it the abusive ad hominem, to distinguish it from other species. To consider whether it is a fallacy, I shall discuss two of Johnson and Blair's six examples quoted and discussed, as well as a more recent example.

In their (1983) and (1993), Johnson and Blair discuss a response in the June 1982 issue of *Harper's* to an article entitled "China stinks", whose author described in unflattering terms a year's experience living in the Chinese province of Zhengzhou. The response characterizes the article as "stench" and "undigested material" that nauseates its readers, and as the work of a "constipated" and "jaundiced" man who spent a year in an outlandish and poverty-stricken province without running water, toilets and other amenities to which he had been accustomed in Indianapolis. Johnson and Blair do not hesitate to characterize this letter to the editor as committing the fallacy of abusive ad hominem. The description of the article's author is abusive, they claim, and obviously irrelevant to the adequacy of

his position. It is not clear, however, that the description of the article's author is mere abuse, or that it is irrelevant to the author's "position". It is in fact a diagnosis of the cause of the article's allegedly undigested and nauseating character. Although it provides no supporting evidence for those who have not read the original article, the letter takes a clear position on what is inadequate about it: it merely details the unpleasantness for someone used to modern conveniences of living in a poor and remote part of the world, without providing any analysis or explanation of the poverty. The diagnosis contributes substantively to the critique by giving the reader a sense of the type of nauseating vomit thrown up in the article.

In their (1993), Johnson and Blair discuss a review in the magazine *Rolling Stone* of Allan Bloom's 1987 best-seller *The closing of the American mind*, in which Bloom criticizes rock music as contributing through its overt sexuality to an overall climate of promiscuity. The reviewer described Bloom's criticism as "inane", conceded Bloom's point that kids in the 80s differ from kids in the 50s in actually having sex rather than just talking about it, commented that this fact seems to drive Bloom crazy, mentioned that the 56-year-old Bloom is still a bachelor, and speculated that the "relish" with which Bloom denounces Mick Jagger might indicate that he is turned on by what Bloom described as Jagger's "pouty lips and wagging butt". Following their two-pronged strategy, Johnson and Blair first note that this response is largely a personal attack that makes no attempt to deal with Bloom's arguments. Then they assert the irrelevance of Bloom's bachelorhood and his conjecturally repressed homosexuality to the appraisal of those arguments. Thus, they conclude, the reviewer commits an abusive ad hominem fallacy.

Are they correct in labeling the attack a fallacy? Certainly, dismissal by the single word "inane" is an inadequate response to a serious argument from a distinguished political philosopher commenting on a significant aspect of contemporary popular culture. And the innuendo that Bloom's critique may be motivated by repressed homosexual desire is offensive. But the reviewer would commit a fallacy only if the personal attack was a piece of reasoning that Bloom's critique was incorrect or his supporting arguments flawed. In fact, the attack comes after the dismissal of Bloom's position, and is not intended to support it. It is gratuitous, but not a flawed piece of reasoning, and so not a fallacy.

A more recent example of the abusive *argumentum ad hominem* is the following letter to the editor:

> Re: Emotional Bardot makes plea for seals (March 23): Is Brigitte Bardot really the compassionate crusader she claims to be?
>
> A quick Google search reveals that she has been found guilty of inciting hatred at least four times by French courts in recent years. Her most recent conviction was in 2004, for remarks in her book, *A scream in the silence*, that viciously attacked gays, Muslims, immigrants and the unemployed. She considers homosexuals to be "fairground freaks" and opposes interracial marriage. Her political hero is Jean-Marie Le Pen, the extreme-right National Front leader.

> This is the champion that animal activists have brought to teach Canadians about ethics and compassion? (Alan Herscovici, executive vice-president, Fur Council of Canada, Montreal, *The Globe and Mail*, 24 March 2006)

The function of this letter is to undermine the standing of the famous French actress as a spokesperson for opposition to the seal hunt. It marshals evidence that in many respects she is not a compassionate person. Her alleged lack of compassion for various groups of human beings does not address her position that the annual seal hunt in Canada should be abolished, or its supporting arguments. In fact, however, media reports attributed no arguments to Bardot, only an appeal to stop what she called a "massacre" and a failed attempt to deliver her message personally to the Canadian prime minister. Since her celebrity was the chief basis for the media attention to her appeal, it is a relevant response to question her standing on this issue, what rhetoricians following Aristotle call her *ethos*.

The sort of personal attack labeled as an abusive ad hominem does in fact occur with some frequency, and it does sometimes succeed in its goal of diverting attention from the substantive claim or argument of one's opponent. But it is not a kind of reasoning, or a kind of argument. So it is not a fallacy.

26.4 The Circumstantial ad Hominem

Late 20th century logic textbooks use the phrase "circumstantial ad hominem" in a variety of ways. Copi (1953), for example, uses it for the *tu quoque*, and only later applies it also to an allegation of bias. Hurley (2003, p. 119) describes it as an allegation that the opponent is predisposed to take a certain position and to argue for it, because of self-interest or dogmatic bias. The textbooks typically interpret such allegations as arguments that the opponent's argument is bad (Copi and Cohen 2002, p. 145; Hurley 2003, p. 119). Johnson and Blair (1993) characterize the circumstantial ad hominem less restrictively as a reference to some circumstance in the arguer's situation intended to discredit the arguer's position. Their examples are correspondingly unusual, and I shall ignore them in order to discuss two typical allegations of self-interest or dogmatic bias.

First example: The previously quoted letter from the executive vice-president of the Fur Council of Canada prompted the following reply:

> Whatever Brigitte Bardot's ethical failings in the minds of some, such as Alan Herscovici of the Fur Council of Canada (Bardot's blind spots–letter March 24), the annual slaughter of baby seals off Canada's east coast is a bloody stain on our national identity. The majority of Canadians are appalled by this massacre and, like Ms. Bardot, want it to end.
>
> Of course, Mr. Hercovici's objection to Ms. Bardot's crusade can only spring from his own pure conscience. One would never accuse him of supporting this ecocide just to protect the profits of the vanity industry (G. Cooper, Toronto, *The Globe and Mail*, 25 March 2006).

The first paragraph of this letter asserts the writer's opposition to the annual seal hunt, regardless of the ethical failings pointed out by the fur industry official, on the ground that it is "bloody" and a "massacre". The second paragraph ratchets up the emotive language by calling the hunt an "ecocide" and uses irony to point out that the fur industry has a vested interest in continuing the hunt. The reader is expected to infer that the official's letter is motivated by this financial interest, which the writer's use of the expression "vanity industry" implies is illegitimate. Thus this part of the letter is clearly a circumstantial ad hominem, in the sense of an allegation that the fur official's attack on Bardot's credentials is motivated by a vested interest rather than by a "pure conscience". Its point is clearly not to show that he was mistaken in what he wrote about Bardot, as textbook accounts of the circumstantial *ad hominem* would have it, but to undermine his credentials in somewhat the same fashion as he undermined Bardot's. As such, it makes a perfectly legitimate point. Further, although the writer uses overheated and unwarranted emotive language rather than reasoned argument to condemn the seal hunt, the writer does assert opposition to it independently of the circumstantial ad hominem attack, and does not use the official's bias as an irrelevant reason for thinking that the seal hunt should be abolished. There is no fallacy of irrelevance in the letter.

Second example: The following sentence was displayed on a screen as part of a presentation in August 2005 on global climate change: "Almost all criticisms of global climate predictions are backed by people with much to lose if policies are changed."[1] Asked in the question period what conclusion he wanted the audience to draw from this point, the author replied: "They are not motivated by a scientific interest in the truth." In subsequent e-mail correspondence, I suggested to him that this sort of circumstantial ad hominem is typically intended as a warning that the opponent's argument should be scrutinized very carefully. He responded: "Exactly! That was the point I wanted to get across to the audience, and that is why I stated explicitly that they should note the affiliation of an author as well as the quality of the citations provided."

Attention to "the affiliation of an author" is a perfectly legitimate critical response to a person's statements or arguments. It can legitimately put one on one's guard. Although it would be a mistake to use an allegation of bias as a proof that a position is incorrect or an argument is flawed, real allegations of bias are not fairly interpreted as committing it. The circumstantial ad hominem, understood as an irrelevant allegation of bias, therefore does not belong in a list of logical fallacies.

[1]The presentation was a public address by Howard W. Barker, a Canadian government scientist, entitled "The real scoop behind global climate change" at the *Hamilton Spectator* auditorium in Hamilton, Canada, on 11 August 2005.

26.5 Summary

Though Johnson and Blair (1977, 1983, 1993) discuss real examples in a fair and nuanced way, they do not establish that there is an *argumentum ad hominem* fallacy. If we accept Govier's articulation of the traditional conception of a fallacy as "a mistake in reasoning, a mistake which occurs with some frequency in real arguments and which is characteristically deceptive", there is no *argumentum ad hominem* fallacy. In its original meaning, an *argumentum ad hominem* is a perfectly legitimate dialectical argument from the concessions or commitments of an opponent that one need not share. The *tu quoque* historically emerged from this sense as an appeal to commitments implicit in the behaviour of one's critic; it legitimately challenges the critic to explain away an apparent inconsistency. The purely abusive ad hominem can be a legitimate attack on an opponent's ethos, a response long sanctioned in the western rhetorical tradition. Otherwise, it is an objectionable diversionary tactic, but not a kind of reasoning, and so not a fallacy. The circumstantial ad hominem, in the sense of an abusive ad hominem which attributes the position of one's opponent to self-interest or a dogmatic bias, raises legitimate suspicion about the credibility of the opponent's statements and arguments.

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Chapter 27
Postscript

Abstract Logical fallacies are common mistakes in reasoning that are commonly deceptive. Their main types are thus inter-derivable with the main criteria of good reasoning. It is a mistake to construe them either as violations of rules for argumentative discussion or as unsatisfactory answers to critical question of argumentation schemes. The teaching of critical thinking should not be structured around a list of fallacies, but one could constructively incorporate them in the context of teaching students how to think well. Faults that deserve mention include belief bias, biased sample, confirmation bias, confusing correlation or sequence with cause, hasty generalization, jumping to conclusions, loss and risk aversion, red herring, slippery slope, stereotyping, and straw man. Ad hominem appeals are not fallacies, but one could well deal with personal attacks in the context of teaching how to find good sources of information.

27.1 Introduction

So-called "fallacy theory" is a recognized component of the field of study variously known as "informal logic" or "philosophy of argument" or "theory of argumentation". It focuses on saying what a fallacy in the logician's sense is, exploring whether there is a general account of what makes things that satisfy this definition a fallacy, developing a taxonomy of fallacies, investigating what constitutes particular fallacies, and exploring how to defend and attack charges that someone has committed a fallacy. Fallacy theory has not been a focus of my scholarly work, but one can extract from the two chapters reprinted in the section on fallacies answers to some of the questions of fallacy theory.

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In ordinary speech, a fallacy is a mistaken view.[1] Logicians in the western tradition have focused on mistakes in reasoning and argument, and have developed an extensive list of types of such mistakes. None of the labels for these types of logical mistake have become part of everyday speech, even among educated people. For example, outside the field of philosophy to charge someone with equivocation is simply to say that they are speaking ambiguously, saying something that can be taken in two ways. It is not to charge them with the logician's fallacy, first identified by Plato (1997, *Euthydemus* 277e–278a) and baptized by Aristotle (1984, *Sophistical Refutations* 4. 165b30–166a7), of trading illicitly on a shift in the meaning of a term in an argument, so as to make the conclusion appear to follow logically when in fact it does not. To take another example, it has taken laborious instruction by academic pedants many years to get people out of the habit of saying 'begs the question' when they mean 'raises the question'. Commentators now tend to say 'raises the question'. They don't use the phrase 'begs the question' to charge someone with having assumed the point at issue in their argument. Similar remarks can be made about other terms used in logic textbooks for various supposed logical fallacies: straw man, composition, division, circumstantial ad hominem, affirming the consequent, denying the antecedent, illicit conversion, *post hoc ergo propter hoc*, *secundum quid* (dropping the qualification), biased sample, hasty generalization, *ad ignorantiam*, *ad verecundiam*, and so forth. Since people do point out mistakes in other people's reasoning and arguments, and do defend themselves against such charges, without using the labels that logicians have invented, one is entitled to be a little sceptical about the usefulness of the labels. If they were that helpful, one might have expected them to enter into use by educated people. The only fallacy charge that seems to have entered into anything like common use is the charge of having uttered a non sequitur, which is a non-specific charge of having drawn a conclusion that does not follow from the reasons one offered in its support.

Nevertheless, the tradition is there, and the labels have some use in pointing scholars to theoretical issues of interpretation and evaluation. In the first of the two chapters reprinted in the present collection, I define fallacies as "common mistakes in reasoning that often deceive both those who commit them and those to whom arguments are directed" (Hitchcock 1995, p. 120; this volume, p. 405). In the second, I endorse and use a very similar definition by Trudy Govier:

> By definition, a fallacy is a mistake in reasoning, a mistake which occurs with some frequency in real arguments and which is characteristically deceptive. (Govier 1995, p. 172)

[1]The *Oxford English Dictionary* (Murray et al. 1971) gives this as chronologically the fourth meaning of the word 'fallacy' to have developed in English, being first attested in Shakespeare's *A Comedy of Errors* in 1590. The earliest two meanings are now obsolete, and the third oldest meaning, the logician's meaning, is first attested in 1562, in the second of three volumes of a comprehensive catalogue of English plants. Readers may test for themselves my impression of the ordinary meaning of the word 'fallacy' in contemporary English by asking people who are not scholars of reasoning and argument, "What is a fallacy?".

A mistake is a failure to do something correctly. Types of mistakes in reasoning are thus correlative to criteria for correct reasoning. One can generate a list of either from a list of the other. Johnson and Blair, for example, started with a classification of fallacies into three main types of mistakes: irrelevant reason, hasty conclusion, problematic premiss (Johnson and Blair 1977, pp. 12–32). Their widely adopted criteria for good reasoning fell out as the opposites of these main types of mistakes: relevance, sufficiency, acceptability. Van Eemeren and Grootendorst, on the other hand, started with a code of conduct for rational discussants (van Eemeren and Grootendorst 1984, pp. 151–175) and generated their list of fallacies as a list of ways in which someone might violate that code (van Eemeren and Grootendorst 1984, pp. 177–192, 1992, pp. 102–106).

My own view is that reasoning and argument have many uses, and that both the criteria for their correctness and the correlative main types of mistakes vary according to the use to which one is putting the reasoning or argument. If one's aim in reasoning is to arrive at a correct conclusion, then one needs adequate information, justified premisses, a justified general warrant in accordance with which one's conclusion follows, and justification for assuming that no exceptions to that general warrant hold in the case at hand (Hitchcock 2006a; Chap. 23 of the present volume). Correlatively, the main types of mistakes in correctness-oriented reasoning are inadequate information, unjustified premisses, unjustified warrant, and exceptions to the applicability of one's warrant. What makes these features of one's reasoning mistakes is that they reduce the likelihood that the conclusion one draws will be correct. Each of them has an indefinitely large number of sub-types, whose enumeration and labeling has a point only if the sub-type is a common mistake that is often deceptive (such as taking a correlation or "association" to show by itself a causal relationship, a species of unjustified general warrant) or is of theoretical interest (such as circular reasoning, a species of unjustified premiss).

Hamblin in his classic book *Fallacies* (Hamblin 1970) used a critique of textbook treatments of recognized logical fallacies and a history of the fallacies tradition to motivate a new branch of formal logic: formal dialectic, the study of rule-governed formal systems of dialogue. He drew this link on the basis of his observation that the European fallacies tradition went back to Aristotle's list in his *Sophistical Refutations* of tricky moves in a rule-governed game of question-and-answer refutations of theses, moves which thus had their natural home as violations of rules of a formal dialectical system. He showed how the fallacy of equivocation could be modeled as such a violation. His conception of a fallacy as a violation of some rule of a dialectical system has been embraced among others by van Eemeren and Grootendorst (1984, 1992), by Hintikka (1987), and by Walton (1992a). This conception of a fallacy is in my view unconvincing, both historically and systematically. Historically, as Woods and Hansen (1997) point out, most of the 13 fallacies in Aristotle's list in his *Sophistical Refutations* are not particularly dialectical. For example, the fallacy of equivocation is a logical mistake in reasoning that can occur just as easily in a speech or essay as in a conversation and is just as mistaken and for the same reason in any of those contexts. Further, in discussing proofs, which are not particularly dialectical, Aristotle identified two

common mistakes: assuming the point at issue and taking a non-cause as cause (*Prior Analytics* 2.16–17.64b29–66a15). In discussing speeches, which are certainly not dialectical, he lists 10 types of merely apparent deductions (*Rhetoric* 2.24.1400b34–1402a28), including equivocation, composition and division, affirming the consequent, post hoc, and *secundum quid* (dropping a qualification). Systematically, one can recognize in one's own reasoning mistakes like ignoring possible alternative explanations ("jumping to conclusions"), which it is highly implausible to interpret as a violation of a rule of a dialogue game. Further, one can make mistakes in a rule-governed dialogue game that are just mistakes in reasoning, not violations of a rule. Douglas Walton at one point proposed a rather narrow definition of a fallacy as "an argumentation technique that could be used rightly in one context of dialogue, but is used wrongly in the particular case in question, in a manner that actually hinders the real and legitimate goals of the type of dialogue" (Walton 1992b, p. 267). He preserved this narrow conception by referring to other errors of reasoning as "blunders" (1992b, p. 267). The usage disguises the reality. A so-called "blunder", if it is a common mistake that is characteristically deceptive, has just as much right to be called a fallacy as a violation of the rules.

Subsequently, Walton connected his conception of a fallacy with work by himself and others on argumentation schemes by defining a fallacy as a type of misuse of an argumentation scheme (Walton 1993, p. 17). The approach of analyzing and evaluating arguments according to the argument schemes that they instantiate and the critical questions associated with those schemes, discussed in Chaps. 18 and 29 of the present volume, makes it possible to distinguish legitimate uses of a certain kind of argumentative move from illegitimate uses that are stigmatized as fallacies. For example, an appeal to ignorance is sometimes legitimate. If for example there is no good evidence that there are ghosts, that is a good reason to conclude that there are no ghosts, provided that there has been an appropriately thorough attempt to find such evidence (following up reported experiences of seeing ghosts, setting up closed circuit television systems in cemeteries and observing the tapes, etc.). An appeal to ignorance has the general form of arguing that p on the ground that we do not know that p', where p' is the contradictory of p. On the argument schemes and critical questions approach, such an appeal can be called a fallacy if the arguer cannot point to an appropriately thorough search for evidence that p. The arguer is taken to have the responsibility of providing satisfactory answers to those critical questions associated with a scheme that are "assumptions". Other questions called "exceptions" put the responsibility on the arguer's critic (Gordon et al. 2007). For example, an exception to an appeal to ignorance might be a theoretical reason for accepting a proposition for whose truth we have no evidence despite an appropriately thorough search for it, such as the postulation by theoretical physicists of so-called "dark matter", which might more appropriately be called "unobservable matter", as the source of gravitational "effects" on observable matter.[2] One can put these points in

[2]For an informal explanation of the concept of dark matter and the reasons for postulating its existence, see https://home.cern/about/physics/dark-matter; accessed 2016 07 24.

the terminology of Toulmin's (1958, 2003) model for the layout of arguments, by saying that the argument's warrant includes certain assumptions but also has certain conditions of exception or rebuttal that either undermine the force of the warrant or provide overriding reasons for rejecting the conclusion drawn.

In some respects, the conception of a fallacy as the unjustifiability of an argument scheme's assumption unduly narrows the class of fallacies, by restricting them to arguments whose scheme is sometimes legitimate. Some forms of argument, such as conversion of a universal affirmative statement, are always mistaken, and if common enough and commonly enough deceptive deserve to be called fallacies. And some recognized fallacies, such as equivocation, cut across argument schemes. In other respects, the conception of a fallacy as the unjustifiability of an argument scheme's assumption unduly broadens the class of fallacies, by counting as a fallacy any failure of any assumption of any scheme, even if the failure is either uncommon or not commonly deceptive.

27.2 The Place of Fallacies in Teaching Critical Thinking

"Do the fallacies have a place in the teaching of reasoning skills or critical thinking?" defends my long-held scepticism about a fallacies approach to teaching critical thinking. I continue to be sceptical about such an approach, and have continued to use textbooks in my teaching of critical thinking that do not make fallacies central to their approach (LeBlanc 1998, Groarke and Tindale 2008, Dong 2010, Bailin and Battersby 2010).

The chapter uses an appraisal-only sense of critical thinking as monitoring intellectual products for acceptability. I have since broadened my conception of critical thinking so that it includes constructive as well as reactive thinking. Of the definitions of critical thinking quoted in Chap. 30 of the present volume, I find most attractive its definition as "reasonable and reflective thinking that is focused on deciding what to believe or do" (Ennis 1985, 1987), because that definition corresponds to what educators and educational theorists have in mind when they talk about critical thinking. What makes thinking "critical" is that it is reflective; in fact, the philosopher John Dewey in the book that first promoted critical thinking as an educational ideal (Dewey 1910) referred to it more often as "reflective thought" than as "critical thinking". Critical thinkers do not just react or plunge ahead in their thinking, but turn back (Latin '*reflectere*') to check whether the thinking is good. Critical thinking involves a strong form of meta-cognition in which the thinker is not just aware of the strategies, principles and rules that govern their thinking but evaluates and adjusts them for suitability to the thinking task.

The broader conception of critical thinking as both constructive and reactive strengthens the case for scepticism about a fallacies approach to teaching critical thinking. In teaching someone how to do something, one should draw the learner's attention in the first place to what is involved in doing it well, and only secondarily to pitfalls to avoid.

The chapter calls for empirical research to determine what kinds of mistakes in reasoning most commonly occur in argumentative texts. In fact, some of this research had already been done when the chapter first appeared. According to Maurice Finocchiaro (1994), both experimental-critical and historical-textual empirical investigators of human reasoning have concluded that the most common flaw of informal reasoning is the failure to consider lines of argument supporting conclusions contrary to the one reached. This finding fits with a broad array of findings by psychologists of the ubiquity of "confirmation bias", defined broadly as "the seeking or interpreting of evidence in ways that are partial to existing beliefs, expectations, or a hypothesis in hand" (Nickerson 1998, p. 175). It is noteworthy that this error does not show up in the typically brief examples used in critical thinking courses as the basis of developing and practising reasoning skills. Nor does it appear in most logicians' list of fallacies, such as the "gang of eighteen" investigated by John Woods (2004).

Mark Pennington, a publisher of materials to help teach writing skills, lists "the top 15 errors in reasoning",[3]—which presumably means the most common 15. I paraphrase the items in his list as follows, indicating with an asterisk supposed mistakes that do not appear in most logicians' lists of fallacies:

1. *substitution of a non-synonymous term in an argument
2. *non sequitur
3. red herring (distraction by an unconnected reference)
4. hasty generalization from very few instances
5. *weakening an argument by criticizing it
6. taking a coincidental sequence to be causal (i.e. *post hoc*)
7. *using as support something not proved to be true
8. false dilemma
9. *comparing unrelated ideas or issues
10. using as a source a questionable authority
11. *contradicting oneself
12. *being inconsistent in the standards applied across cases
13. *omitting a needed piece of information
14. *oversimplifying
15. small or unreliable sample.

The discrepancy between this list of errors and those singled out by logicians reflects the difference in perspective between someone teaching students to write discursive essays and someone teaching students to analyze and evaluate already written argumentative texts. Two of "the top 15 errors in reasoning" would not even be regarded by logicians as mistakes—namely, (5) weakening an argument by criticizing it and (9) comparing unrelated ideas or issues. And logicians would describe the supposed error (7) of using as support something not proved to be true

[3]See http://blog.penningtonpublishing.com/reading/the-top-15-errors-in-reasoning/, accessed 2016 07 18.

more circumspectly as failing to provide support for a premiss that needs it; not everything can be proved to be true. Missing from Pennington's list are two apparently common errors in reasoning: misinterpretation of a quotation and attacking a straw man. Misinterpretation of a quotation showed up in four out of 50 arguments selected by random sampling methods from a collection of English-language books in the library of a research-intensive university (Hitchcock 2002); in each case, the author quoted someone in support of an attribution of some position to that person, but the quotation did not support the attribution. As for attacking a straw man, it is a common phenomenon in polarized debates, in the political arena and elsewhere; to make attack easier, the attacker will either misrepresent an opponent's statement or make up an opposing viewpoint that nobody holds.

Logicians have one list of common mistakes, writing instructors another. Cognitive psychologists have yet another list, based on results of their experiments:

- confirmation bias ("the seeking or interpreting of evidence in ways that are partial to existing beliefs, expectations, or a hypothesis in hand" [Nickerson 1998, p. 175])
- belief bias (disruption of impartial evaluation of evidence or argument by prior beliefs [Sá et al. 1999, Evans and Feeney 2004])
- availability heuristic (judging frequency by the ease with which instances come to mind [Kahneman 2012, p. 129])
- representativeness heuristic (judging probability by the similarity of a description to a stereotype while ignoring base rates [Kahneman 2012, pp. 149–150])
- anchoring effect (influence on one's estimate of a quantity by previous consideration of another irrelevant quantity [Kahneman 2012, p. 119])
- endowment effect (over-valuation of something that one owns for use [Kahneman 2012, pp. 289–299])
- loss aversion (weighting losses as worth more than gains [Kahneman 2012, pp. 283–286])
- framing effects: ("the unjustified influences of formulation on beliefs and preferences" [Kahneman 2012, p. 364]).

The experiments of Daniel Kahneman and Amos Tversky were motivated by discovery in their own intuitive thinking of deviations from what on reflection they judged to be correct (Kahneman 2012, p. 6). Both the design of their experiments and the interpretation of their results have been questioned (Stein 2013, Shleifer 2012). In particular, Stein (2011) faults their work for ignoring the distinction between belief and acceptance (cf. Cohen 1992), mixing probabilistic and causal factors in their scenarios, and relying on Pascalian rather than Baconian probability (cf. Cohen 1977, 1989). Nevertheless, Shleifer (2012) notes that the biases identified by Kahneman and Tversky explain well such common irrational economic behaviour as overpaying to reduce insurance deductibles, insuring against small losses, and buying actively managed rather than indexed mutual funds. Shleifer (2012) among others questions the explanation of supposed mistakes by two

systems for thinking, an intuitive fast system 1 and a deliberative slow system 2,[4] as well as the framing of the experimental tasks as exercises in bounded rationality. There are also controversies about the appropriate way of dealing with cognitive biases. The experimental results summarized by Kenyon and Beaulac (2014) indicate that education is not likely to have much of a direct effect. Thus the proposal in the chapter to teach fallacies by correcting mistakes in the reasoning of individual students as they occur was misguided. It was also impractical.

At the time of writing this chapter (July 2016), I was unable to discover empirical studies of large corpora attempting to determine the frequency of reasoning errors in argumentative texts. Such studies may be too time-consuming to be worth the trouble, since it seems impossible to automate the search for reasoning errors. It might be possible to determine the frequency of attributions of errors by name, for which the frequency of occurrence of the name on Web pages might be a rough stand-in. A Google search in July 2016 produced the following ranking of supposed errors by frequency of the occurrence on Web pages of their name, searched for as a quoted string:

1. stereotyping (12.6 million)
2. small sample (9.555 million)
3. jumping to conclusions (4.52 million)
4. red herring (3.77 million)
5. slippery slope (2.72 million)
6. loss aversion (2.64 million)
7. appeal to popularity (2.44 million)
8. risk aversion (1.7 million)
9. appeal to pity (1.18 million)
10. equivocation (1.13 million)
11. correlation to cause (674,000)
12. two wrongs (524,000)
13. confirmation bias (503,000)
14. guilt by association (474,000)
15. ad hominem (471,000)
16. begging the question (457,000)
17. illicit conversion (453,000)
18. *tu quoque* (452,000)
19. straw man (443,000)
20. loaded question (432,000)
21. *ad populum* (400,000)
22. circular reasoning (355,000)
23. appeal to force (353,000)

[4]The terms ‘system 1’ and ‘system 2’ were introduced by Stanovich and West (2000). Dual-processing theorists do not suppose that the two systems are necessarily instantiated in physically separate modules. The labels are shorthand for two different ways that humans think. System 1 includes both innate and learned abilities.

24. undistributed middle (231,000)
25. poisoning the well (208,000)
26. bandwagon effect (194,000)
27. hindsight bias (190,000)
28. appeal to tradition (183,000)
29. biased sample (177,000)
30. false dilemma (175,000)
31. availability heuristic (144,000)
32. endowment effect (136,000)
33. false analogy (130,000)
34. hasty generalization (128,000)
35. spurious correlation (122,000)
36. suppressed evidence (122,000)
37. anchoring effect (114,000)
38. framing effect (112,000)
39. appeal to ignorance (110,000)
40. gambler's fallacy (109,000)
41. fallacy of composition (105,000)
42. hasty conclusion (102,000)
43. *ad baculum* (92,800)
44. *ad misericordiam* (88,500)
45. *ad verecundiam* (83,200)
46. affirming the consequent (80,700)
47. *ad ignorantiam* (78,900)
48. *ad baculum* (77,500)
49. genetic fallacy (66,600)
50. questionable authority (64,300)
51. representativeness heuristic (62,800)
52. denying the antecedent (57,200)
53. dropping the qualification (47,300)
54. unrepresentative sample (45,300)
55. conjunction fallacy (43,300)
56. fallacy of division (41,100)
57. *post hoc* fallacy (38,900)
58. base rate fallacy (33,900)
59. belief bias (33,400)
60. fallacy of equivocation (25,500)
61. projection bias (23,500)
62. irrelevant conclusion (14,100).

These rankings can only be a rough guide to the frequency with which a named error is charged, for many reasons. First, the terms are not always used to charge someone with making an error, and the proportion of pages with such a use may differ from one term to another. For example, many pages containing the word 'stereotyping' simply describe how one group of people typically characterizes another group,

without stigmatizing the characterization. Nevertheless, the dramatically higher frequency of this term reflects a very common usage. Another example of disproportionately high frequency is the word 'equivocation', which is often used as a label for a double meaning rather than for the fallacy of equivocation. An example of disproportionately low frequency is the phrase 'biased sample', which almost always picks out an error of reasoning or methodology. Second, some errors of reasoning have more than one name in common use. The error picked out by the phrase '*post hoc* fallacy', for example, can be characterized in many ways, such as 'treating a coincidence as a cause', so the low ranking of this term understates the frequency with which the error is charged. Third, the frequency of charges of committing an error does not necessarily reflect the frequency with which the error is committed. Belief bias, for example, has been repeatedly detected experimentally (Evans and Feeney 2004) but is unlikely to be detected outside of experimental settings. Fourth, some labels have entered the language only recently, and thus can be expected to be less widely used than the frequency of the error that they name would lead one to expect. With all these caveats, and using some judgment in demoting some items on the list and promoting others, I would suggest that the following mistakes in reasoning, listed in alphabetical order, are strong candidates for being singled out in the teaching of critical thinking (but in the context of teaching good ways of reasoning from which these mistakes are deviations):

- belief bias
- biased/ unrepresentative sample
- confirmation bias
- confusing correlation or sequence with cause
- jumping to conclusions
- loss/ risk aversion
- red herring
- slippery slope
- small sample/ hasty generalization
- stereotyping
- straw man.

With the exception of *post hoc* reasoning, none of these mistakes appears in the list of mistakes identified by Aristotle and repeated in many contemporary textbooks in logic and critical thinking. The low ranking of the traditional fallacy labels supports my claim earlier in this section that the traditional labels for fallacies have not become part of everyday vocabulary, even among educated people.

27.3 The ad Hominem

The chapter entitled 'Is there an *argumentum ad hominem* fallacy' was written in 2006 for a Festschrift in honour of Ralph Johnson and Tony Blair, the founding fathers of informal logic as a self-conscious sub-discipline of philosophy. Hence it

focuses specifically on their textbook's commendable treatment of ad hominem appeals. The chapter adapts a more general treatment of the question in a presentation at the 2006 International Conference on Argumentation in Amsterdam (Hitchcock 2007). It parallels a more specific treatment of the analysis of the ad hominem by Frans van Eemeren and Rob Grootendorst, published in a Festschrift in honour of van Eemeren (Hitchcock 2006b).

The case that there is no *argumentum ad hominem* fallacy depends on a conception of a fallacy as a common mistake in reasoning that is commonly deceptive. Given this conception, the case still seems strong to me. If one were to broaden the conception of a fallacy to include illegitimate diversionary tactics in interpersonal discussion of an issue, then the abusive ad hominem would count as a fallacy under certain conditions, which might be built into the very definition of the term 'abusive ad hominem' in order to avoid assigning that pejorative label to legitimate questioning of a person's character. The *tu quoque* and the circumstantial ad hominem would however continue to be in principle quite legitimate argumentative moves.

In the previous section of the present chapter, I reported that the phrase 'ad hominem' had a moderately high frequency of occurrence on Web pages, ranking 15th among 62 terms for supposed mistakes in reasoning. It did not appear in the list of 11 mistakes in reasoning that I judged worthy of being attended to in the teaching of critical thinking. Nevertheless, there is a case for dealing with personal attacks in the teaching of critical thinking. They form a natural part of a unit devoted to finding good sources of information. Allegations of bias, incompetence or bad character are sometimes relevant to judging the quality of a source of information, and it is worth specifying the conditions under which they are relevant and giving practice and feedback on making and justifying judgments of their relevance or irrelevance. The currently common vicious personal attacks, amounting to harassment, on social media give further point to such exercises.

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Part VII
Informal Logic and Critical Thinking

Chapter 28
The Significance of Informal Logic for Philosophy

Abstract Informal logic is a new sub-discipline of philosophy, roughly definable as the philosophy of argument. Contributors have challenged the traditional concept of an argument as a premiss-conclusion complex, in favour of speech-act, functional and dialogical conceptions; they have identified as additional components warrants, modal qualifiers, rebuttals, and a dialectical tier. They have objected that "soundness" is neither necessary nor sufficient for a good argument. Alternative proposals include acceptability, relevance and sufficiency of the premisses; conformity to a valid argument schema; and conformity to rules for discussion aimed at rational resolution of a dispute. Informal logic is a significant part of philosophy.

Informal logic is a new sub-discipline within philosophy. Its subject-matter is roughly defined by a set of questions which Ralph Johnson and Tony Blair of the University of Windsor set out under 13 headings in an appendix to their opening address at the First International Symposium on Informal Logic, held in Windsor in June 1978 (Johnson and Blair 1980, pp. 25–26). Among the key questions in their list are the following:

- What are the criteria to be invoked in logical criticism?
- What is the nature of argument?
- What is the nature of fallacy?
- How should fallacies be classified?
- Are the validity/soundness criteria of evaluation [sc. of arguments] inappropriate or outmoded? If so, what should replace them?
- Can principles be formulated that assign the responsibilities of give-and-take in argumentation?
- What different kinds of assumptions can be distinguished in argumentation? How are missing premisses to be identified and formulated?
- How does the context of argumentation affect its meaning and interpretation?

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In sum, informal logic is the study of arguments.

Of course, the questions investigated by informal logic are not new; Aristotle already addressed many of them. What is new is the central focus on argumentation in natural language, as an interpersonal, social, purposive practice. What is new too, at least in comparison to other philosophical investigations of arguments and reasoning in the last 100 years, is the scepticism about the value of formal logic as a tool for analyzing and evaluating natural-language arguments. This scepticism is implicit in the very name "informal logic", with all its unfortunate connotations of sloppiness and lack of rigour. What is the significance of this new sub-discipline for philosophy?

Reasoning and argument are central to the practice of philosophy, and also central to its subject-matter, in particular to its focus on knowledge. As a sub-discipline devoted to the theoretical study of reasoning and argument, informal logic has the potential to make a substantial contribution to philosophy in general. I shall consider these potential contributions under two headings: the concept of argument and the evaluation of arguments. I ignore another equally substantial and equally important subject of investigation within informal logic: the theory of fallacies. And I make no attempt to be comprehensive in the contributions I mention; in fact, I am acutely conscious of having failed to mention several important contributions on the topics I discuss.

28.1 The Concept of Argument

What is an argument? Traditionally an argument is defined as a system composed of premisses and a conclusion, a definition which goes back to the early Stoics of the third century BCE (Diogenes Laertius 1925 VII.45, 76 = Von Arnim 1968, *SVF* II 235, Crinis fr. 5). The premisses and conclusion may be spoken, written or thought. By the conclusion is meant that which is inferred from, or is presented as following from, the premisses. By the premisses are meant the components from which the conclusion is inferred, or presented as following. Thus an argument is at heart a piece of reasoning in which something is inferred from, or presented as following from, some other thing(s). Using a variant terminology from that of "premiss" and "conclusion", one can sum up by saying that on this traditional conception an argument is a claim-reason complex.

The conception of an argument as a claim-reason complex has come under sustained attack in the informal logic tradition of the last 20 years, on a number of grounds.

28.1.1 Arguing as a Speech Act

First, it conceives of an argument as a certain kind of product. But any product is the result of an act of production which is prior to the product. In this case, the act is an act of arguing, a certain kind of speech act which deserves investigation to determine its specific characteristics. Arguing turns out to be a complex illocutionary act, whose typical performance can be given the usual Searlian analysis (Searle 1969) in terms of propositional content conditions, essential conditions, preparatory conditions, and sincerity conditions. Among the preparatory conditions for felicitous arguing, for example, are that (the arguer believes that) the intended audience does not already accept the conclusion and that (the arguer believes that) the intended audience will accept the premisses (van Eemeren and Grootendorst 1984, p. 44). In addition to being an illocutionary act with distinctive felicity conditions, arguing typically has a distinctive intended perlocutionary effect, that of persuading the arguer's intended audience to accept the conclusion on the basis of the asserted premisses.

28.1.2 The Function(s) of Argument

Second, even if we treat arguments as products rather than as speech acts, the traditional conception of argument as a system composed of premisses and conclusion ignores the purpose for which such systems are created. This purpose, some claim, is rational persuasion (Johnson 1996, p. 105). Others (e.g., Ennis 1997, p. 6) speak of its purpose as that of proving or establishing the conclusion. Argument is an alternative to coercion on the one hand and to irrational or non-rational persuasion on the other. Construed this way, the practice of argument has an important place in a democratic social and political system, in which all those affected have a voice in decisions which affect them; ideally those decisions are reached as a result of informed and vigorous discussion and debate. The practice of argument also has an important place in personal decisions about what to believe and what to do, since such decisions are likely to be wiser if reached on the basis of careful consideration of relevant arguments than if reached some other way.

A more pluralistic approach to argument treats rational persuasion of the audience, or establishing the conclusion, as only one possible purpose of argument. Claim-reason complexes can serve the functions of articulating our thought processes to ourselves as we work out the solution to a problem, explaining to somebody else why we hold a certain belief or undertake a certain course of action, giving a causal or logical explanation of some already acknowledged general truth, working out the consequences of a hypothesis in order to design an experimental test of it, exposing to another person an internal inconsistency in their beliefs, and so forth. It is an open question whether these functions are parasitic on the usually privileged function of rational persuasion or proof.

28.1.3 The Macrostructure of Arguments

Third, there is an influential current in informal logic, stemming from Stephen Toulmin's *The Uses of Argument* (1958), which holds that there are more components to an argument as product than just the claim (or conclusion) and the reasons (or premisses). Toulmin uses the word "claim" for the conclusion and the word "data" or "grounds" for the premisses. But he identifies four other components of the system, of which three are particularly noteworthy.

What Toulmin calls the "warrant" is the arguer's answer to the question: How do you get from what you have to go on (your data or grounds) to your claim? The answer, which is always unstated in the original argument, will have the form of a generalized conditional statement, perhaps with some modal qualifier. But its function is that of a rule of inference, licensing the making of the claim on the basis of the arguer's data or grounds. Toulmin uses the hackneyed but now familiar example of the argument, "Harry was born in Bermuda, so he is probably a British subject". Asked how this conclusion is obtained, the arguer will say, "Generally, a person born in Bermuda will be a British subject." Toulmin's concept of a warrant explains very well a feature common to virtually all natural-language argument: it is not formally valid. It is rather, as I would say, "enthymematically valid" or "materially valid". That is, it is valid in virtue of a rule of inference which is not purely formal, which has some content. Such rules may be grounded semantically, scientifically, legally, or in a myriad other ways.

A second component of many arguments is what Toulmin calls the "modal qualifier". It occurs in his example of Harry's citizenship in the form of the word "probably" qualifying the conclusion and the word "generally" in the warrant. Such words or phrases indicate the force of the warrant, whether it holds universally (indicated by "must"), usually (indicated by "generally" or "probably"), presumptively (indicated by "presumably"), or sometimes (indicated by "possibly").

A third novel component in Toulmin's analysis is what he calls "rebuttals". Rebuttals are a peculiarity of arguments whose warrant justifies only a presumption that the conclusion is true. Such presumptions are subject to rebuttal, by showing that some exception-making condition obtains. Pollock (1990, p. 79) has pointed out that, in addition to such rebuttals, there can be what he calls "undercutting defeaters", which attack the connection between a *prima facie* reason and a conclusion. In Toulmin's example, the presumption that someone born in Bermuda is a British subject might be rebutted by showing that neither of his parents was a British subject. Such a rebuttal might be incorporated in the original argument in the form of an "unless" clause qualifying the conclusion: Harry is a British citizen, unless neither of his parents was a British subject.

28.1.4 Argument as Dialogical Exchange

Fourth, some theorists of argument take conversational argument as primary, and assimilate other forms of argument to this primary form. An argument in this sense is a conversational exchange. Different forms of argumentative conversational exchange are conceivable. What contemporary speech communication theorists call a "confrontation sequence" is an attempt by one interlocutor to refute the other's thesis by eliciting admissions which generate some absurdity: in short, Socratic refutation, called in the Middle Ages the "obligation game". What C.L. Hamblin in his classic work, *Fallacies* (1970), called a "why-because" game is an attempt by one interlocutor to elicit a satisfactory justification of an initial claim made by the other interlocutor. Paul Lorenzen formulated intuitionistic logic as a set of strip rules which enable one interlocutor to break down the commitments of another interlocutor in order to show that they entailed some proposition; Lorenzen's work has been developed by Barth and Krabbe (1982). Conversational argument can be studied empirically, in an effort to detect regularities in its occurrence and structure; an influential theory (Jackson and Jacobs 1980, 1981; Jacobs and Jackson 1981, 1982) holds that conversational argument is a systematic method for regulating disagreement. It can also be studied formally, by setting up mathematically well-defined systems in which it is possible to determine, for example, whether a player in a certain situation has a winning strategy; Douglas Walton and Erik Krabbe have made important contributions in this direction (e.g. Walton and Krabbe 1995). And it can be studied quasi-empirically, by setting up a system of rules which function as an ideal model for a critical discussion and interpreting actual arguments, even non-conversational arguments, in the light of this ideal model (van Eemeren and Grootendorst 1984, 1992a).

Even theorists who take arguments to be primarily monological rather than dialogical (e.g. Johnson 1996) wish to add to the structural tier of premisses and conclusion what they call a "dialectical tier", in which the arguer anticipates objections to the premisses and inferential links of the structural tier. The dialectical tier is a part of the argument, because the argument is what serves the function of rational persuasion, and responding to anticipated objections is a constitutive part of an attempt at rational persuasion.

28.2 The Evaluation of Arguments

So much on the analysis of arguments. A second major focus of informal logic is the evaluation of arguments. It may seem surprising that there is no consensus within informal logic, or outside it, on what is to count as a good argument.

28.2.1 The Rejection of Soundness

There is however wide agreement within informal logic on the inadequacy of one conception of a good argument which is influential in contemporary philosophy. I refer to what is called a "sound argument": a formally valid argument with true premisses. (See for example Schumm's entry on "soundness" in the 1995 *Cambridge Dictionary of Philosophy*.) There are obvious counterexamples to the hypothesis that an argument is good if and only if it is sound in this technical sense. We can see that some arguments which we take to be good are not sound by reflecting on examples of perfectly acceptable arguments whose premisses are not all true, or whose inferential step is not deductively valid. For example, quantitative reasoning about the real world often relies on estimates or assumptions which are conceded to be idealizations or mere guesses; the cogency of such reasoning can be tested by seeing if the conclusion is much different when the assumptions are changed—in technical terminology, whether the conclusion is robust. And some arguments which we regard as good have, in Toulmin's terminology, modally qualified warrants which license only a probable or presumptive conclusion; a simple example is an argument from generally reliable authority, e.g. that it will probably rain today, because this morning's forecast said there was a 90% probability of precipitation. (This latter sort of counterexample would not be accepted, however, by all researchers in informal logic; there are defenders of what is stigmatized as "deductive chauvinism", the view that all good arguments are deductively valid. Even such deductive chauvinists, however, are likely to recognize that deductive validity encompasses more than formal validity; an argument like "Jones is a bachelor, so Jones is male" is deductively valid, in the sense that the meaning of its components rules out the possibility that its premiss is true and its conclusion false, even though it is not formally valid.)

There are also counterexamples in the other direction, sound arguments which our critical practice regards as no good. For example, any proposition follows necessarily from itself. Hence an argument of the form "p, therefore p'" is deductively valid, and indeed formally valid. But the truth of p does not make this a good argument. Repetition of this sort is a highly effective rhetorical device, but it is of no value at all as proof. If the truth of p is already known to the audience, the argument is useless; if the truth of p is in question, the argument is of no help in providing the audience with reasons for thinking that it is true.

28.2.2 A Functional Approach

In generating counterexamples to the thesis that arguments are good if and only if they are sound, we appeal partly to our current '"naive" (i.e., supposedly theoretically untutored) critical practice in assessing arguments. But we appeal also to the supposed function of arguments, e.g., the function of rational persuasion. This

functional approach provides an important clue, I think, to the development of criteria for evaluating arguments. In general, if to belong to a certain kind is to have a certain function, then an individual is a good member of that kind if and only if it has the characteristics that enable it to perform that function well. A good paring-knife is one which has the characteristics that enable it to pare well. Just so, a good argument is one which has the characteristics that enable it to perform well whatever function arguments serve. If different arguments serve different functions, then the criteria for evaluating them may well be different too, varying according to the function of the argument under consideration. This perspective enables us to understand some of the divergence among informal logicians in the criteria they propose for the evaluation of arguments.

28.2.3 Acceptability, Relevance, Sufficiency

A popular set of criteria, due originally to Johnson and Blair (1977), is the triad of acceptability, relevance and sufficiency. Each premiss must be acceptable. Each premiss must be relevant to the conclusion. And the premisses must be jointly sufficient. Acceptability is here relative to the particular evaluator, or to the particular audience for whom the evaluator is judging the worth of the argument. It refers not to the mere fact that the evaluator or audience accepts the premiss, but to its being reasonable for the evaluator or audience to accept the premiss, whether or not they in fact do so. Thus a premiss can be acceptable to a particular person, even though the person does not in fact accept it. Further it can be acceptable even if it is false; a false premiss is acceptable to someone if that person has good reason to accept it.

The criterion of relevance is controversial. John Woods (1994), among others, has severely attacked attempts to construe relevance as a semantic relation, expressed by some such phrase as "contributing to the truth of". It seems more defensible to construe relevance as a pragmatic concept, expressed by some such phrase as "contributing to the (assumed) goal in the context". However construed, it is doubtful whether relevance of each premiss is a necessary condition for a good argument. To say so is to imply that a good argument can be turned into a bad one by adding an irrelevant premiss. And this does not seem like an acceptable consequence. The argument may become inelegant, or burdened with a superfluity, but in typical cases adding an irrelevant premiss will leave the argument still capable of fulfilling its function.

The criterion of sufficiency is true but schematic. It is of course true that a good argument must be such that its premisses, if true, would provide enough support to the conclusion. By definition of "enough", if they did not provide enough support, the argument would not be doing its job. But how much is enough, in what circumstances?

Toulmin's concept of a warrant can provide the basis for a more specific approach. An argument which is supposed to prove its conclusion definitively, or

beyond a reasonable doubt, needs an exceptionless, or almost exceptionless, warrant. One which is supposed merely to make its conclusion probable, or to establish a presumption, or to register it as a hypothesis worth continued investigation, needs respectively warrants that are usually true, that are presumptively true, or that are sometimes true.

28.2.4 Argument Schemata

This approach using modal qualifiers is more substantive, but still schematic. There is some empirical evidence from cognitive psychology that human beings generally do not reason at such a high level of abstraction (Nisbett et al. 1987). When they reason deductively, for example, they make mistakes when required to apply such abstract forms as *modus ponens* and *modus tollens*. But they are virtually 100% accurate when they apply to familiar contexts such specifications of these abstract forms as permission schemata ("if condition A is met, then you may do B"), obligation schemata ("if condition A is met, then you must do B") or causal schemata ("if A occurs, then B will occur as a result").

What seems to be appropriate, then, is to develop a set of argumentation schemata, expressed at the middle level of abstraction at which human beings typically do their thinking. There might be an argumentation schema, for example, for reasoning from the results of a controlled experiment. There is a growing literature, both in North America and in Europe, on such argumentation schemata; see for example Kienpointner (1992) and Grennan (1997). Some researchers have developed dozens of them, each with its own pattern and set of validity conditions.

28.2.5 The Fallacies Approach

Finally, one approach to the evaluation of arguments is through a search for fa1lacies. Outsiders often identify informal logic with the study of the informal fallacies, which are recognized to be something not covered by formal logic, and to be faults which arguments do in fact commit. Many researchers within informal logic, however, are sceptical of a fallacies approach to the evaluation of arguments. In the first place, the traditional fallacy labels, such as ad hominem or appeal to authority (Locke's ad verecundiam), describe forms of argument which are often perfectly reasonable. Quite a lot of careful and valuable research has been done in informal logic on identifying the conditions under which a given argumentative move is legitimate and the conditions under which it is fallacious. Secondly, from a pedagogical point of view, organizing the teaching of practical skills of argument evaluation around a taxonomy of fallacies encourages unduly negative attitudes to argument, tends to substitute name-calling for substantive engagement with the content of an argument, and runs into the problem that the exercise of pinning a

particular fallacy label on a particular argument is fraught with controversy, even among experts.

Approaches to fallacies tend, as one would expect, to reflect the general approach to the understanding of argument. Those who take a dialectical or conversational approach tend to have a wider conception of the types of mistakes that arguments can display. One persuasive analysis of the abusive ad hominem, for example, takes it as having nothing to do with the adequacy of a premiss or sufficiency of an inferential link, but rather as an illegitimate move at the confrontation stage of a critical discussion, a move which tries to undermine the right of one of the discussants to put forward and defend their point of view (van Eemeren and Grootendorst 1992b). When we look at actual cases of abusive ad hominem, we find that they fit this analysis better than any analysis in terms of arguments as claim-reason complexes.

28.3 Conclusion

What I hope to have shown through this brief selective review is that informal logic investigates many questions which are of great philosophical interest and importance. Further, these questions are inter-linked, and form the subject-matter of a sub-discipline which has some integrity, although of course it has links to other branches of philosophy, as well as to such other disciplines as speech communication, psychology and linguistics. No other sub-discipline of philosophy studies these questions thematically. Informal logic, then, is a part, and an important part, of philosophy

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Chapter 29
Informal Logic and the Concept of Argument

Abstract Informal logic studies the identification, analysis, evaluation, criticism and construction of arguments. An argument is a set of one or more interlinked premiss-illative-conclusion sequences. Premisses are assertives, not necessarily asserted by anyone. Conclusions can be assertives, directives, declaratives, commissives or expressives. Each can be expressed either in language or by visual images or physically. Two arguments can be linked either by having a conclusion of one as a premiss of the other or by having one as a premiss of the other. A box-arrow system for diagramming arguments thus conceived is illustrated with reference to three expressed arguments; the diagrams show that the diagramming system can handle conditional proof, argument about an arbitrary instance as a proof of a universal generalization, argument by cases, and reductio ad absurdum. A final section lists issues in informal logic and gives some indication of the range of positions taken on these issues.

29.1 Introduction

According to its namers, informal logic "is best understood as the normative study of argument. It is the area of logic which seeks to develop standards, criteria and procedures for the interpretation, evaluation and construction of arguments and argumentation used in natural language." (Blair and Johnson 1987, p. 148; similarly, Johnson and Blair 2000, p. 94) The name "informal logic" is somewhat unfortunate. For those who use "logical" as a synonym of "formal", it is an oxy-

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D. Hitchcock, *On Reasoning and Argument*, Argumentation Library 30,
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moron. In any case, the research programme of informal logic does not preclude the use of formal methods or appeal to formal logics. Its distinctiveness consists in its consideration of a set of questions that are not addressed in the specialist journals of formal logic, such as the *Journal of Symbolic Logic* and the *Notre Dame Journal of Formal Logic*, or in such histories of formal logic as that by William and Martha Kneale (Kneale and Kneale 1962). It might in fact better be called "theory of argument". Its questions have however traditionally been regarded as part of logic, broadly conceived. The name can thus be taken to refer to that part of logic as traditionally conceived that is not covered by contemporary formal logic.

Johnson and Blair (2000, pp. 99–100) group the questions investigated by informal logic under the headings of argument identification, argument analysis, argument evaluation, and argument criticism. In accordance with the definition quoted in the opening sentence of this chapter, one should add argument construction as a fifth heading. Because of limitations of space and time, this chapter deals with just one question within informal logic, the question: What is an argument?

29.2 Technical and Everyday Senses of 'Argument'

In western philosophy, an argument is traditionally defined as "a system composed of premisses and a conclusion" (Diogenes Laertius 1925, 7.45, citing a Stoic definition). The plural of "premisses" is a Stoic idiosyncrasy: few other philosophers have accepted the Stoic denial (Sextus Empiricus 1935, 2.443) that there are one-premissed arguments. But, even with an amendment to allow for one-premissed arguments, the definition is not very satisfactory, for two reasons: it requires a further explanation of what a premiss is and what a conclusion is, and it forecloses by stipulation alternative conceptions of the components of an argument. It is therefore useful to develop a more informative and less question-begging conception, starting from everyday usage of the word "argument" and sharpening that usage so as to circumscribe a class of entities that is an appropriate subject for theoretical reflection.

In English, the word "argument" and the corresponding verb "argue" are used in two quite clearly distinguishable senses.

One sense is that in which we say such things as "John Searle argued that no computational system can have a semantics" or "the *Summa Theologica* of Thomas Aquinas contains five arguments for the existence of God". In this sense, arguing requires only one arguer (who in cases of collaboration in the production of an argument can be a group of people). The arguer expresses a point of view on a question, and offers as support for this position one or more reasons. The expression of the point of view and the provision of one or more reasons in its support constitute a complex of speech acts. The arguer addresses these speech acts to one or more readers, listeners or observers, who need not reply. Arguing in this sense is typically (though not always) emotionally neutral, and typically not accompanied by hostility.

The other sense is that in which we say such things as "they were arguing with one another" or "they had a bitter argument" or "she argued with him". In this sense, arguing requires at least two arguers; if one argues with oneself in this sense, then one sequentially takes two different roles. The arguers express to each other divergent opinions on some question. Each attempts to get the other(s) to accept their point of view, not necessarily by offering reasons in support of it. Emotional intensity and even hostility often accompany such disputes, though not always.

For ease of reference, I shall call these the reason-giving and the disputational senses of "argument" and "argue". Informal logic studies arguments in the reason-giving sense. It is worth noting that English is apparently unique in using the same word for these two senses. In classical Greek, for example, the reason-giving sense is expressed by the word *logos* (e.g. in Plato 1997, at *Phaedo*, at 90b–91c) in one of its many senses, whereas the disputational sense is expressed by the word *amphisbêtêsis* or *antilogia*, "dispute" or "controversy". In Latin, the reason-giving sense is expressed by the word *argumentum*, "proof" or "evidence", the disputational sense by the word *disputatio*, "debate" or "dispute". In French, as Plantin (2003, p. 174) points out in detail, the reason-giving sense is expressed by the verb *argumenter* ("to argue [that]") and its cognates, the disputational sense by the verb *discuter* ("to discuss", in an aggressive way). In Spanish (Claudio Duran, personal communication), the reason-giving sense is expressed by the word *argument*, and the disputational sense by the words *discusión* (discussion) or *controversia* (controversy) or *disputa* (dispute). In Russian, the reason-giving sense is expressed by the word *dovod* (supporting reason), the disputational sense by the word *spor* or *ssora*. In German, the reason-giving sense is expressed by the word *Argument*, the disputational sense by the word *Disput*. The reader is invited to check how other languages handle the distinction.

Reason-giving and disputation can of course coincide in a particular case. But not all reason-giving occurs in disputes; in fact, most of it occurs outside the context of disputes, or at least outside explicit ones. And not all disputes involve reason-giving; typically they do, but typically as well they involve other components that are intrinsic to the dispute. Productive disputation requires reason-giving. But if reason-giving and disputing were shown in an Euler diagram, the circles would overlap.

29.3 Argument as Discourse Supporting a Point of View by Offering One or More Reasons

An argument in the sense studied by informal logic can thus be conceived initially as a type of discourse in which the author expresses a point of view and offers one or more reasons in support of that point of view. We can make this conception more precise by considering in the first place what it is to offer a supporting reason for a point of view, and how one can do so. A typical means of doing so is to utter a

sentence of a language, or something equivalent to a sentence. Searle (1979) has proposed a taxonomy of the illocutionary acts that people perform in uttering sentences, a classification based on differences in the point of the act. *Assertives* have as their point to commit their utterers to the truth of an expressed proposition *p*; they include not only stating that *p* but also hypothesizing, suggesting, boasting, and deducing that *p* (Searle 1979, p. 13). *Directives* have as their point to get the addressee to do something; they include requesting, advising and asking (13–14). *Commissives* have as their point to commit the utterer to do something; they include promising and contracting (8, 14). *Expressives* have as their point to express a psychological attitude of the utterer to the state of affairs specified by the proposition expressed; they include apologizing, congratulating and thanking (15–16). *Declaratives* have as their point to make something the case by the very utterance of the sentence; they including declaring war, christening, delivering judicial verdicts and stipulating how one is going to use a certain expression (16–20).

As Van Eemeren and Grootendorst point out (1984, p. 43), only an assertive (or something reconstructible as an assertive, such as a rhetorical question) can count as the offering of a supporting reason for a point of view. We can test this claim by considering examples of other sorts of illocutionary acts followed by "so" followed by an arbitrary sentence. If we consider a directive followed by "so" followed by a directive, such as:

* What time is it? So you must go home.

we find it difficult to make sense of such discourse, except by supposing that the speaker assumes that a correct answer to the question implies that it is past time for the addressee to go home. It is easier to make sense of a commissive followed by "so" followed by an assertive, such as:

? I promise to pick up some milk on the way home. So you don't need to get it.

But we can only make sense of such discourse because to make a commitment to do something in the future is implicitly to predict that one will do it. The argument would be more straightforward if one made the prediction explicitly by means of an assertive:

I will pick up some milk on the way home. So you don't need to get it.

We strain to make sense of an expressive followed by "so" followed by an assertive, such as:

* Congratulations on your anniversary. So you are married.

The act of congratulating a couple on their anniversary implies that they are married, but congratulating them is an awkward way of supporting the claim that they are married. It would be much more straightforward to say something like:

I congratulated them on their anniversary. So they are married.

Similar problems arise in making sense of a declarative followed by "so" followed by an assertive:

> * I hereby sentence you to two years less a day in prison. So the guards will now take you to prison.

As with directives, we need to suppose an intermediate step in which the speaker expresses a commitment to the existence of the state of affairs brought about by the declarative:

> You have just been sentenced to two years less a day in prison. So the guards will now take you to prison.

Thus to offer a supporting reason by uttering a sentence, or something equivalent to a sentence, is to perform some sort of assertive, i.e. to commit the utterer to the truth of the expressed proposition. The word "truth" needs to be understood broadly as applying to normative and evaluative propositions as well as descriptive ones, for the following discourses make sense as arguments:

> One must not cause unnecessary harm. So it is wrong to give someone distressing news that the person does not want to hear.
> All things considered, this car is the best model of the type we want that is in our price range. So let's buy it.

It is possible, however, to offer a supporting reason without uttering a sentence. Drawings, figures, photographs, paintings, gestures, body language and other non-linguistic communicative devices can serve as premisses of an argument. Groarke (1996) urges the recognition of visual arguments. Gilbert treats verbalized or verbalizable premiss-conclusion structures as one of four possible modes of argument, defined as "*any exchange of information centred on an avowed disagreement*" (Gilbert 1997, p. 104; italics in original). He calls this mode the "logical-critical" mode. Emotional arguments rely on the use and expression of emotion, and can be communicated without language (83). Visceral arguments rely on physical activity, such as touching or body language (84). "Kisceral" arguments rely on the intuitive or the imaginative (86). Although Gilbert uses the disputational rather than the reason-giving sense of argument, he gives convincing examples of reason-giving that is not verbalized. What is common to these various types of reason-giving is that their authors express to one or more addressees a commitment to the truth of a proposition.

Having specified a necessary condition for offering a supporting reason—namely, expressing to one or more addressees a commitment to the truth of a proposition—and indicated a variety of ways in which one may satisfy this necessary condition, we can gain further precision on the reason-giving sense of argument by considering what sorts of points of view can function as conclusions supported by the reason or reasons offered. Again, we can use the "so" test, this time focusing on what comes after the word "so" rather than what comes before it. Clearly we can express the conclusion of an argument by means of an assertive:

The whale suckles its young. So it is a mammal.

But, as Pinto (2001b) points out, the arguer's endorsement of a point of view may be a directive, such as a request for information (*you were there, so what was it like?*) or a recommendation to do something (*there is a forecast of thundershowers, so let's cancel the picnic* or *I'm feeling cold, so please close the door*). It can also be a commissive (*I know how difficult it will be for you to get the milk, so I promise you that I will pick it up on the way home*), an expressive (*my conduct was inexcusable, so I apologize most sincerely*), or a declarative (*the evidence establishes beyond a reasonable doubt that you committed the crime of which you are accused, so I hereby find you guilty as charged*).

As with supporting reasons, conclusions can be expressed not only by uttering sentences of a language, or things equivalent to a sentence, but also by producing visual images, using "body language" including facial expressions, or performing physical actions like touching someone. Such non-verbalized conclusions are typically implicit in the communicative activity, and thus somewhat indeterminate.

29.4 Arguments as Invitations to Inference

What is crucial to an argument is the claim that the reasons collectively support the conclusion. The addressee of an argument is invited to accept the conclusion on the basis of the reasons offered. In Pinto's happy phrase, "Arguments are invitations to inference" (Pinto 2001c, p. 37), where "inference" means "the mental act or event in which a person draws a conclusion from premisses, or arrives at a conclusion on the basis of a body of evidence" (32). In inferring, a person adopts or reinforces an attitude towards the proposition embedded in the conclusion. These attitudes include a range of doxastic attitudes, from being convinced of it through being inclined to believe in it and suspecting it to considering it possible and having no idea about it (Pinto 2001b, p. 12). They also include such non-doxastic attitudes to propositions as fearing, desiring, intending and hoping (2001b, p. 16).

The condition that an argument is an invitation to an inference from the offered reasons to the conclusion applies even in suppositional reasoning and argument where the conclusion drawn shares the suppositional status of a premiss; the conclusion may in fact be an absurdity whose derivation will subsequently be used, in conjunction with an acknowledgement of its absurdity, to reject that premiss. It also applies, obviously, to arguing purely dialectically, from the assumptions of an interlocutor that one does not oneself share.

The claim that the offered reasons support the conclusion can be marked linguistically, by means of an illative expression governing the conclusion or a reason. Let us use the expression *premiss indicator* for an illative like "since" which (in its illative use) indicates that the immediately following assertive is offered in direct support of the speech act performed by uttering the main clause to which the "since" clause is subordinate, and the expression *conclusion indicator* for an illative

like "therefore" which (in its illative use) indicates that the immediately preceding assertive is offered in direct support of the immediately following speech act. To introduce a reason by a premiss indicator is to perform a special type of assertive, which we might call premissing: to premiss a proposition is to put it forward as a (perhaps partial) basis for inferring a conclusion. Similarly, to introduce a conclusion by a conclusion indicator is to perform a special type of speech act (whether assertive, directive, commissive, expressive or declarative), which we might call concluding: to conclude a proposition is to put it forward for acceptance on the basis of one or more assertives offered as supporting reasons. Note that acceptance does not always mean adopting a doxastic attitude to the proposition; accepting an apology, for example, means believing that the apologizer bears some responsibility for the act for which the apology is offered and that this act was wrong and that the apologizer is sincerely sorry for this act, but it also means forgiving the apologizer, in the sense of not demanding further acts of contrition, reparation or penitence.

Arguments do not always include illatives, and even those that do include illatives typically attach them to only one component of the argument, a reason or the conclusion. But components of an argument not introduced by an illative are nevertheless premissed or concluded. Thus an argument is a claim-reason complex consisting of an act of concluding (which may be of any of the five main types in Searle's taxonomy of speech acts) and one or more acts of premissing (each of which is an assertive). These acts are correlative; the act of concluding is an act of concluding from the reasons, and each act of premissing is an act of offering support for the conclusion. To capture this relationship, it is appropriate to conceive of an argument as a sequence consisting of a set of reasons followed by a conclusion indicator followed by a conclusion, or equivalently as a conclusion followed by a premiss indicator followed by a set of one or more reasons. In such a sequence, the illative does the work of premissing each reason and concluding the conclusion; hence, we do not need to mention these acts in characterizing the reason and conclusion. Arguments with no explicit illative can be regarded as having one implicitly.

29.5 Extensions: Potential Arguments and Equivalence Classes of Arguments

So far I have been talking about actual arguments, actually advanced by people who speak, write or otherwise communicate them to one or more addressees. For the purposes of this chapter, I propose to extend the concept of argument further, in two respects. First, I propose to count as arguments discoursal claim-reason complexes that are merely entertained in thought, such as the pros and cons considered by people trying to come to a decision about what to do. The example fits ordinary usage, since we do talk about such people as considering the relevant arguments. But the general characterization goes beyond it, since it includes reasoning by

oneself to a conclusion (*tomorrow is garbage day, so I had better put out the garbage*), whose content is not usually described as an argument. The reason for this extension is that the same considerations of acceptability of the supporting reasons and sufficiency of the support relation between reasons and conclusion apply to such solo reasoning as apply to other-directed arguments. Second, for the same reason, I propose to count as arguments merely potential discoursal claim-reason complexes never uttered or even mentally entertained by anyone.

In this extended sense, a simple argument is a sequence of three objects: a speech act *c* of any type concerning some proposition, an illative such as the word "since" (in its inferential sense), and a set *P* of one or more assertives. Expressed in this canonical form, the following would count as arguments:

> <express admiration for Picasso's *Guernica*, since, {assert that Picasso's *Guernica* brings home in a vivid way the horrible consequences for the innocent of aerial bombing in contemporary warfare}>
> <suspect that Goldbach's conjecture is correct, since, {assert that mathematicians have found no counterexample in 200 years of trying}>

These sequences may be purely possible ones, never articulated by anyone. The first could be expressed by saying, "What a wonderful painting is Picasso's *Guernica*. It brings home in a vivid way the horrible consequences for the innocent of aerial bombing in contemporary warfare." The second could be expressed by saying, "Goldbach's conjecture is probably correct, since mathematicians have found no counterexample in 200 years of trying."

General as it is, this definition is still less general than our ordinary usage of the word "argument". For the same argument can be expressed in different ways, and even in different languages. To accommodate this fact, we can extend the above definition to the equivalence class of all sequences with the same meaning as a given sequence. If <*c*, ∵, P> is the given sequence, we may label its equivalence class [<*c*, ∵, P>]. It will include sequences with one or more constituents with the same meaning as the corresponding constituent of <*c*, ∵, P>, as well as corresponding sequences in the reverse order with a conclusion indicator in place of the premiss indicator, such as <P, ∴, *c*>. Then a simple argument may be defined as follows:

> *Simple argument* = $_{df}$ a class of those triples of the form <*c*, ∵, P> or <P, ∴, *c*> that are equivalent in meaning to one another, where *c* is an attitude to some object, ∵ is a premiss indicator, ∴ is a conclusion indicator, and P is a set of one or more assertives.

Following traditional terminology, we will refer to an assertive in such a set P as a *premiss* and to such an attitude *c* as a *conclusion*. Our usage is however non-traditional in this respect, that a premiss is neither a sentence nor a proposition nor a statement, but an assertive; and a conclusion is neither a sentence nor a proposition nor a statement, but a speech act of some type. Further, it should be noted that, in actual thinking, speaking, signing and writing, arguments often lack an inference indicator, the force of the illative being communicated by a combination of semantic and contextual factors.

The definition of a simple argument just proposed is vague, since it is indeterminate in some cases whether two linguistic expressions of an attitude have the same meaning. The vagueness is similar in degree to, and has the same source as, the vagueness in the concept of a proposition as the eternal object signified by the utterance of a sentence. A more precise conception of argument could be obtained by treating each linguistic variation in the formulation of an argument as a new argument. Someone who adopted this approach would confront vagueness at another place, in considering whether two distinct arguments have the same force.

29.6 Complex Direct Arguments

So far we have been considering arguments in which one or more reasons are offered in direct support of a conclusion. A comprehensive conception of argument should allow for complex arguments, in which one or more of the reasons offered in direct support of a conclusion is in turn argued for. Such complex arguments can be analysed into component simple arguments. Anselm's ontological argument for the existence of God in the second chapter of his *Proslogium*, for example, is a tightly structured chain of inter-linked simple arguments. We can extend our definition to complex arguments, with the help of the concept of subordination, defined as follows:

> *Subordinate argument* = $_{df}$ an argument whose conclusion is a premiss of another argument.

Subordinate arguments are commonly referred to in the informal logic literature and textbooks as *subarguments*. We need also the concept of superordination, which is the converse relation:

> *Superordinate argument* = $_{\text{df}}$ an argument with a premiss that is the conclusion of another argument.

We can now define a complex argument as a set of two or more simple arguments, with a hierarchy of subordination between them:

> *Complex argument* = $_{\text{df}}$ a set of two or more simple arguments, each of which is either superordinate to or subordinate to at least one other argument in the set, and one of which (the *main argument*) is not subordinate to any other argument in the set.

We can illustrate this definition with the concluding part of the first book of Plato's *Republic*, where Socrates argues, with the agreement of Thrasymachus at each step, that injustice is never more profitable than justice:

> … a just soul and a just man will live well, and an unjust one badly.
> Apparently so, according to your argument.
> And surely anyone who lives well is blessed and happy, and anyone who doesn't is the opposite.
> Of course.
> Therefore, a just person is happy, and an unjust one wretched.
> So be it.
> It profits no one to be wretched but to be happy.
> Of course.
> And so, Thrasymachus, injustice is never more profitable than justice.
> Let that be your banquet, Socrates, at the feast of Bendis.
> (Plato 1997, *Republic* I. 353e-354a, Grube-Reeve translation)

This excerpt is the concluding part of a single extremely complex argument, in which attitudes are expressed to about 50 different propositions. The excerpt can be represented in the standard notation for sets and sequences as follows:

> {<{assert that a just soul and a just man will live well and an unjust one badly, assert that anyone who lives well is blessed and happy and anyone who doesn't is the opposite}, ∴, assert that a just person is happy, and an unjust one wretched>, <{assert that a just person is happy and an unjust one wretched, assert that it profits no one to be wretched but to be happy}, ∴, assert that injustice is never more profitable than justice>}

Figure 29.1 displays the argument in a standard box-arrow system of diagrammatic representation.

Thus this text is a complex of two simple arguments, each with two premisses, with the conclusion of the subordinate argument identical to one premiss of the main argument. Both Socrates and Thrasymachus independently affirm each of the ultimate premisses. It is noteworthy that Thrasymachus gives only grudging acknowledgement of the conclusions that Socrates draws in each simple argument, including the conclusion of a previous argument with which the quoted excerpt begins. It is also noteworthy that the argument is reported, not advanced in his own name by its author (Plato). This fact adds an additional level of complexity to the text.

29.7 Suppositional Arguments

The preceding definition covers direct arguments to a conclusion. It needs to be expanded to cover as well reductio ad absurdum arguments, suppositional arguments with a conditional conclusion, and other arguments in which a conclusion is drawn on the basis of an argument. The easiest way to accommodate such arguments is to expand the concept of a premiss so that it includes not only assertives whose content is a proposition but also arguments (which are complexes of illocutionary acts). Consider for example Euclid's proof that there are more than any given [finite] number of primes:

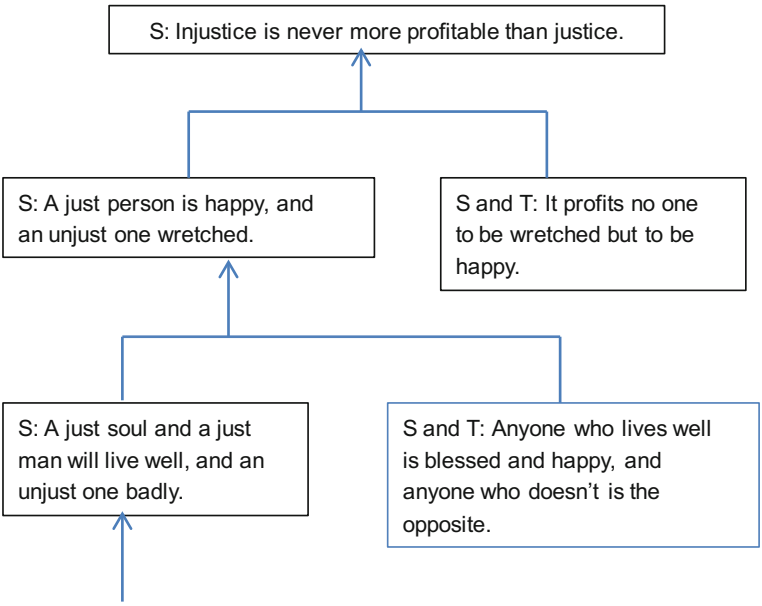

Fig. 29.1 Box-arrow diagram of the argument in Plato's *Republic* I. 353e–354a (Grube-Reeve translation) (*change in this chapter*: to make this diagram parallel with the other two box-arrow diagrams in the chapter, I have inverted it from the previously published version)

> The prime numbers are more numerous than every given number of prime numbers. Let the given prime numbers be A, B, C. I say that there are more prime numbers than A, B, C.
>
> For let the least number measured [i.e. divisible–DH] by A, B, C be taken and let it be DE, and let a unit DF be added to DE. Then EF either is prime or not. [See Fig. 29.2.]
>
> First, let it be prime. Therefore A, B, C, EF are prime numbers discovered to be more numerous than A, B, C.
>
> Next, let EF not be prime. Therefore it is measured by some prime number. (VII. 31) Let it be measured by the prime number G. I say that G is the same as none of A, B, C. For if it is possible, let it be so. A, B, C measure [i.e. are factors of–DH] DE, and therefore G will measure DE. And it measures EF. And being a number G will measure the unit DF, which is absurd. Therefore G is not the same as one of A, B, C. And therefore it is supposed that G is not the same as one of A, B, C; and it is supposed prime. Therefore A, B, C, G are prime numbers discovered to be more numerous than A, B, C; which it was necessary to prove. (Euclid 1969-1973, *Elements* IX.20; translation by the present author).

Fig. 29.2 Euclid's illustration in *Elements* IX.20

Euclid's proof is a single[1] argument with several layers of embedding. It can be represented in the standard notation for sets and sequences as follows:

> <assert that the prime numbers are more numerous than every given number of prime numbers, ∵, {<{suppose that the given prime numbers are A, B, C; suppose that the least number measured by A, B, C is taken; suppose that the least number measured by A, B, C is DE; suppose that a unit DF is added to DE}, ∴ suppose that EF either is prime or not>, < {suppose that EF either is prime or not, <{suppose that EF is prime}, ∴, suppose that A, B, C, EF are prime numbers discovered to be more numerous than A, B, C>, <{{<{suppose that EF is not prime, assert VII.31}, ∴, suppose that EF is measured by some prime number>, <{suppose that EF is measured by some prime number}, ∴, suppose that EF is measured by the prime number G>, <{suppose that G is the same as one of A, B, C, suppose that A, B, C measure DE}, ∴, suppose that G will measure DE>, <{suppose that EF is measured by the prime number G, suppose that G will measure DE, suppose that G is a number}, ∴, suppose that G will measure the unit DF>}, assert that it is absurd that G measures the unit DF}, ∴, suppose that G is not the same as one of A, B, C>, <suppose that G is not the same as one of A, B, C}, ∴, suppose that A, B, C, G are prime numbers discovered to be more numerous than A, B, C>}}, ∴, suppose that the prime numbers are more numerous than A, B, C>}}>

The outermost argument supports a universal generalization with an argument that an arbitrarily chosen instance has the property of interest. This embedded argument is an argument by cases, whose premisses are a supposition about what the two cases are (supported by a sub-argument) and two embedded arguments reaching the desired conclusion for each case. The argument for the first case is very simple. The second is complex, with a main premiss supported by a reductio ad absurdum argument which is the heart of the proof. We can diagram the whole argument as in Fig. 29.3.[2]

Thus allowing arguments to be premisses permits one to represent in a uniform way generalizations from a result proved for an arbitrarily chosen instance, proofs by cases, and reductio ad absurdum arguments. Similarly one can represent proofs by conditional reasoning, as in Saint Anselm's ontological argument for the existence of God:

> **Truly there is a God, although the fool has said in his heart, There is no God.**
> AND so, Lord, do you, who do give understanding to faith, give me, so far as you knowest it to be profitable, to understand that you are as we believe; and that you are that which we believe. And indeed, we believe that you are a being than which nothing greater can be conceived. Or is there no such nature, since the fool has said in his heart, there is no God? (Psalms xiv. 1). But, at any rate, this very fool, when he hears of this being of which I speak–a being than which nothing greater can be conceived–understands what he hears, and what he understands is in his understanding; although he does not understand it to exist…. Hence, even the fool is convinced that something exists in the understanding, at least, than

[1] *Correction in the present republication*: The word 'single' replaces 'simple'.

[2] *Change in this chapter*: For ease of understanding, in the diagram I have replaced the word 'suppose' with 'then^S' at the beginning of conclusions drawn directly from suppositions. The word 'then' signals their status as a conclusion. The superscripted 'S' signals their inheritance of a suppositional status from a premiss.

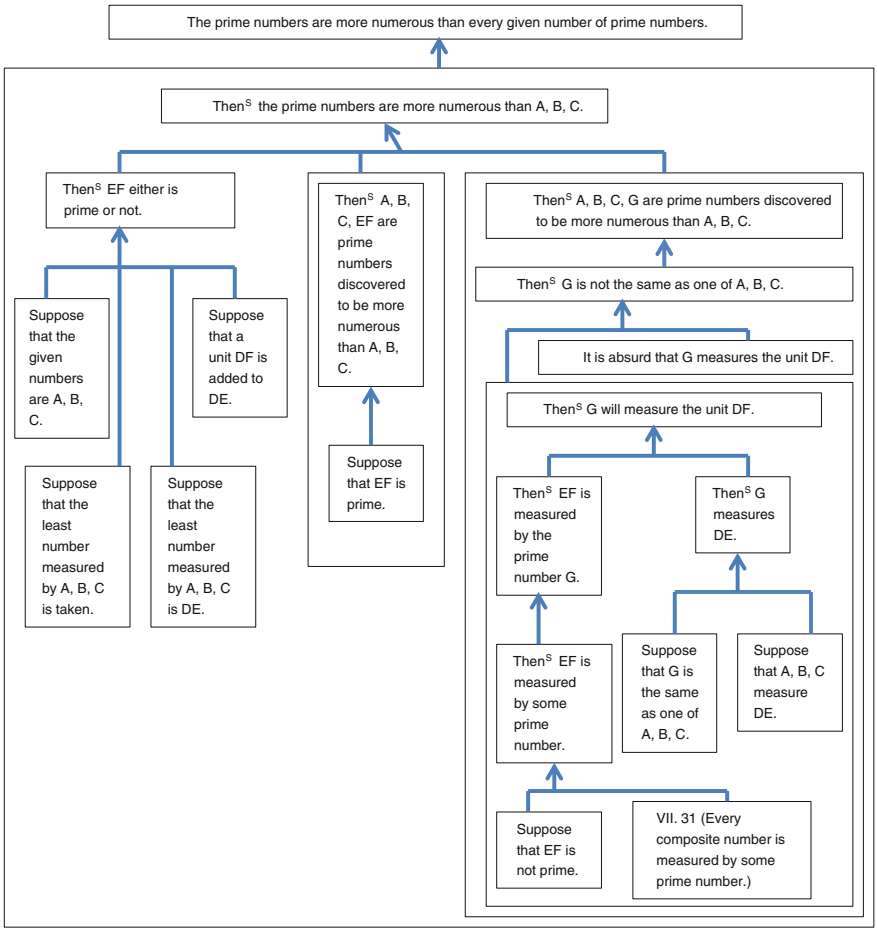

Fig. 29.3 Box-arrow diagram of Euclid's proof in his *Elements* IX.20 that there is no largest prime number, showing a triple embedding of suppositional arguments

which nothing greater can be conceived. For, when he hears of this, he understands it. And whatever is understood, exists in the understanding.

And assuredly that, than which nothing greater can be conceived, cannot exist in the understanding alone. For, suppose it exists in the understanding alone: then it can be conceived to exist in reality; which is greater. Therefore, if that, than which nothing greater can be conceived, exists in the understanding alone, the very being, than which nothing greater can be conceived, is one, than which a greater can be conceived. But obviously this is impossible.

Hence, there is no doubt that there exists a being, than which nothing greater can be conceived, and it exists both in the understanding and in reality. (Anselm 1950, *Proslogium* 2, Deane's translation; paragraphing altered to facilitate understanding).

Anselm's argument can be represented in the notation of sets and sequences as follows:

{<{assert that God is a being than which nothing greater can be conceived, assert that the fool has said in his heart there is no God, assert that when he hears of this he understands it, assert that whatever is understood exists in the understanding}, ∴, assert that something exists in the understanding, at least, than which nothing greater can be conceived>, {<{< {suppose that that than which nothing greater can be conceived exists in the understanding alone}, ∴, suppose that that than which nothing greater can be conceived can be conceived to exist in reality as well as in the understanding>,[3] assert that it is greater to exist in reality than to exist in the understanding alone}, ∴, assert that if that than which nothing greater can be conceived exists in the understanding alone the very being than which nothing greater can be conceived is one than which a greater can be conceived>, <{assert that if that than which nothing greater can be conceived exists in the understanding alone the very being than which nothing greater can be conceived is one than which a greater can be conceived, assert that it is impossible that the very being than which nothing greater can be conceived is one than which a greater can be conceived}, ∴, assert that that than which nothing greater can be conceived cannot exist in the understanding alone>}, <{assert that something exists in the understanding, at least, than which nothing greater can be conceived, assert that that than which nothing greater can be conceived cannot exist in the understanding alone}, ∴, assert that there exists a being than which nothing greater can be conceived and it exists both in the understanding and in reality>}.

Diagrammatically, Anselm's argument looks as in Fig. 29.4.[4]

The main argument has two premisses, each an assertion. The first main premiss is supported by a simple argument with four premisses, each an assertion. The second main premiss is supported immediately by two premisses, one an assertion of a conditional and the other an assertion of the impossibility of its consequent. The assertion of the conditional is in turn supported by two premisses, one of them an argument from the supposition of the antecedent of the conditional to a suppositional conclusion[5] and the other an assertion.

---

[3] *Added in the present republication*: One might wonder how this conclusion follows, and might be inclined to strengthen the supposition so as to make the inference more plausible, but that is interpretation rather than the faithful analysis illustrated here.

[4] *Change in the present republication*: For ease of understanding, in the diagram I have replaced the word 'suppose' with 'then^{S}' at the beginning of conclusions drawn directly from suppositions. The word 'then' signals their status as a conclusion. The superscripted 'S' signals their inheritance of a suppositional status from a premiss.

[5] *Added in the present republication*: The reader might wonder how such a piece of suppositional reasoning can be an argument and how it can be a premiss. It counts as an argument because Anselm (in this translation*) explicitly uses the illative 'then' to indicate that he is drawing a conclusion from what he has just supposed. It counts as a premiss because anything put forward in support of a conclusion is a premiss and Anselm puts this piece of suppositional reasoning forward in support of a conclusion. The western logical tradition has not counted suppositional reasoning used to support a further claim as a premiss, but only tradition counts against doing so. In chapter 32, where I revise the definition of argument developed in the present chapter, I no longer call suppositional reasoning used to support a claim a premiss, but instead speak of it as adduced in support of the claim. The new terminology bows to the traditional reluctance to allow that an argument can be a premiss, but the basic idea is still the same.

*The translation is in this respect unfaithful. A more faithful translation would read: "For if indeed it exists in the understanding alone, it can be conceived to exist also in reality." (Latin: *Si enim vel in solo intellectu est, potest cogitari esse et in re.*) Thus the embedded suppositional reasoning turns out to be an artifact of the translation rather than part of the structure of what

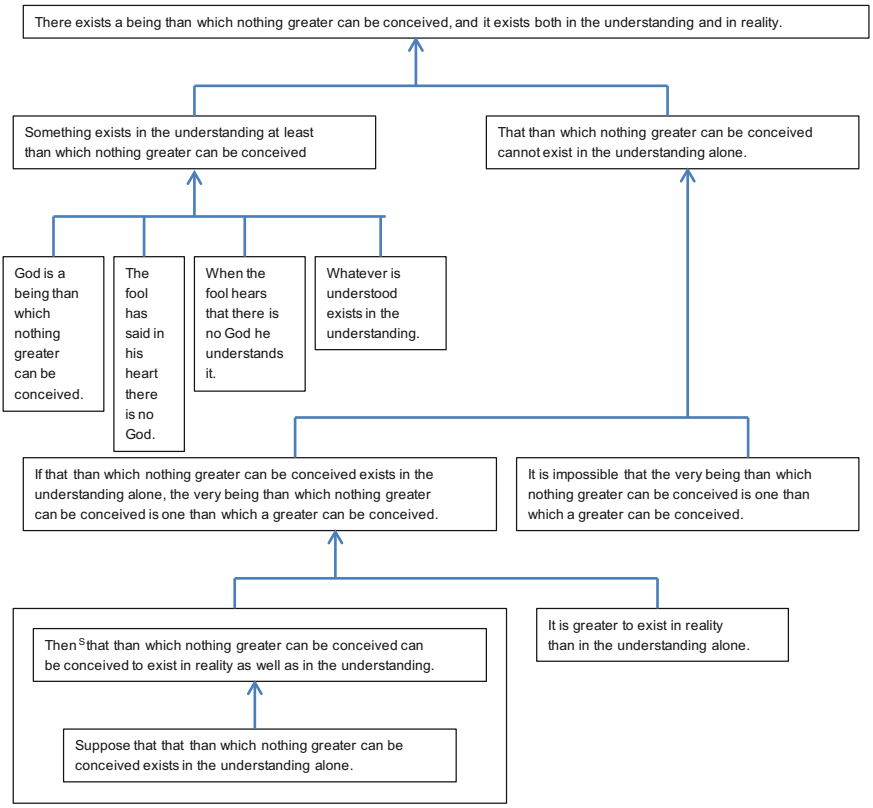

Fig. 29.4 Box-arrow diagram of Anselm's argument in his *Proslogium* 2 that God exists, showing an embedding of suppositional reasoning used to support a conditional claim

The approach of allowing arguments as premisses also permits one to represent proofs by mathematical induction in the same uniform way.

29.8 First Summary

In summary, one can integrate the foregoing considerations into a single recursive definition of an argument, as follows:

(Footnote 5 continued)

Anselm wrote. There are real-life examples of suppositional reasoning used to support a conditional claim, such as some rather technical arguments in mathematics.

1. Any set of the form {<*c*, ∵, P>} or {<P, ∴, *c*>} is an argument, where the conclusion *c* is a speech act of any type, ∵ is a premiss indicator, ∴ is a conclusion indicator, and the set P of premisses is a set of one or more assertives.
2. Any set equivalent in meaning to a set of the form described in clause 1 is an argument.
3. If a conclusion in an argument A is a premiss in an argument B, then A ∴ B is an argument.
4. If {<P, ∴, *c*>} is an argument, and A is an argument, then so are {<A ∴ P, ∴, *c*>} and {<A, ∴, *c*>}. Similarly for {<*c*, ∵, P>}.
5. Nothing is an argument unless it can be constructed in a finite number of steps using the above rules.

29.9 Competing Conceptions of Argument

To appreciate the force of the preceding definition, one can compare it to recent thematic discussions of the concept of argument.

Charles Hamblin in his classic chapter "The concept of argument" (1970, pp. 224–252) develops an account of what an argument is from the generally agreed conception of an argument as "whatever it is that is typically expressed by the form of words '*P*, therefore *Q*', '*P*, and so *Q*', '*P*, hence *Q*'; or, perhaps, '*Q*, since *P*', '*Q*, because *P*'", and cites Whately's *Elements of Logic* (1848) for the standard terminology of "premisses" for whatever is expressed by *P* in such forms and "conclusion" for whatever is expressed by *Q* (228). He approaches indirectly the task of saying what is typically expressed by such forms of words, through the question of what constitutes a good argument. This question he addresses dialectically, first enunciating a set of "alethic" criteria based on the concept of truth, then overcoming their inadequacy by shifting to a set of epistemic criteria based on the concept of knowledge, and then in turn overcoming the inadequacy of the epistemic criteria by shifting to the following set of dialectical criteria based on the concept of acceptance (by a single person or by a group of persons):

> (D1) *The premisses must be accepted.*
> (D2, 3) *The passage from premisses to conclusion must be of an accepted kind.*
> (D4) *Unstated premisses must be of a kind that are accepted as omissible.*
> (D5) *The conclusion must be such that, in the absence of the argument, it would not be accepted.* (Hamblin 1970, p. 245, italics in original)

Hamblin does not say in so many words what account of argument these criteria imply. If we assume that the criteria for a good argument, like the criteria for a good pruning knife or for a good eye, are those that are jointly sufficient and individually necessary for it to do its work well, then Hamblin's criteria imply that an argument

has as its function to secure acceptance of its conclusion by its addressee(s) on the basis of acceptance of its premisses. Thus we may attribute to Hamblin a definition of an argument as an attempt to get one or more people to accept an expressed conclusion *Q* by adducing in its support some premisses *P*. This definition is more restrictive than the conception advanced by the present author in this chapter, in at least three respects. First, it covers only simple arguments, not complex ones. Second, it does not explicitly allow an argument to be a premiss. Third, and most importantly, it restricts arguments to a single function: considerations for and against a certain decision that one rehearses to oneself do not count as arguments, nor is there any allowance for arguments designed to prove or justify their conclusion, where acceptance is not enough and perhaps not even necessary. Hamblin's definition differs from the preceding conception in at least two additional respects. Rather curiously, he does not treat a linguistic communication of the form "*P*, therefore *Q*" as an argument; rather, an argument for him is what such a form of words expresses, i.e. some sort of abstract object, whose components and ontological status he does not specify. In addition, he makes no allowance for modal qualification of premisses and conclusions, e.g. in suppositional arguments.

Douglas Walton (1990, p. 411) proposes to define argument as

> a social and verbal means of trying to resolve, or at least contend with, a conflict or difference that has arisen between two (or more) parties. An argument necessarily involves a claim that is advanced by at least one of the parties.

This definition fits the disputational sense of "argument" much better than the reason-giving sense. It includes among arguments verbal exchanges of conflicting claims (A: *Yes, you did.* B: *No, I didn't.*) in which the parties give no supporting reasons. It excludes written texts whose authors provide reasons to support a claim that nobody has ever questioned or rejected, for example, mathematical proofs of theorems which nobody has previously thought about. It also excludes discourses in which a speaker makes a case for a claim that the listeners already accept, as a way of reinforcing the adherence of the audience to the claim (as in preaching to the converted). There may be a point to focusing theoretically on verbal expressions of conflict, but it would be less confusing to use some other word than "argument" for them. Perhaps "disputation" would be a better word.

Pinto (2001c), as already noted, distinguishes inference, "the mental act or event in which a person draws a conclusion from premisses, or arrives at a conclusion on the basis of a body of evidence" (32), from argument, initially characterized as "a set of statements or propositions that one person offers to another in the attempt to induce that other person to accept some conclusion" (32). The success of such an attempt, he points out, is not just a matter of its causing its addressee(s) to accept its conclusion; for example, if someone concedes the conclusion merely out of exhaustion from an argument's overwhelming length and complexity, then the argument has not persuaded this addressee to accept its conclusion. What is crucial is that the addressee make the mental inference that corresponds to the move in the

argument from premisses to conclusion. Thus "arguments are invitations to inference" (Pinto 2001c, p. 37). This conception of argument has been central to the development of the definition proposed in this chapter. But Pinto's conception differs from the present definition in that it treats arguments as products with a particular purpose (to get the addressee to accept the conclusion) rather than as abstract objects that might be used for various purposes.

Ralph Johnson proposes the following definition:

> An argument is a type of discourse or text–the distillate of the practice of argumentation–in which the arguer seeks to persuade the Other(s) of the truth of a thesis by producing the reasons that support it. In addition to this illative core, an argument possesses a dialectical tier in which the arguer discharges his dialectical obligations. (Johnson 2000, p. 168)

The practice of argumentation to which Johnson refers in this definition he defines as "the sociocultural activity of constructing, presenting, interpreting, criticizing, and revising arguments." (Johnson 2000: pp. 12, 154) The present author has argued, and Johnson has apparently accepted (Johnson 2002, p. 313), that his intention is best captured by adding to this definition of the practice the qualifying phrase "for the purpose of reaching a rationally shared position on some issue" (Hitchcock 2002, p. 291). Further, to avoid the circularity of defining arguments in terms of argumentation and argumentation in terms of arguments, Johnson must recognize explicitly in his definition of argument (as he does implicitly elsewhere in his book) that arguments occur in contexts other than that of argumentation. The following revision of Johnson's definition of argument, intended to meet this and other difficulties, is one that Johnson apparently accepts (Johnson 2002, p. 313):

> An argument is a spoken discourse or written text whose author (the arguer) seeks to persuade an intended audience or readership (the Other or the Others) to accept a thesis by producing reasons in support of it. In addition to this illative core, an argument possesses a dialectical tier in which the arguer discharges his dialectical obligations. (Hitchcock 2002, p. 289)

The dialectical obligations to which Johnson refers are obligations to address objections to and criticisms of the illative core and to consider alternative positions. In response to criticism of his controversial requirement that arguments must have a dialectical tier, Johnson has clarified his position: not all arguments have a dialectical tier, but "the *paradigm* case of an argument–the one that we should base our theories on and make policies over–is that in which there is both illative core and dialectical tier" (Johnson 2002, p. 316). The definition of argument proposed in the present chapter clearly differs from Johnson's definition in treating arguers' discharge of their dialectical obligations as extrinsic to their actual argument. The exclusion of such dialectical material from arguments proper conforms to our ordinary usage of the term "argument", and is compatible with Johnson's insistence that arguers have a responsibility to discharge their dialectical obligations. It might be better to use the word "case" for the whole complex consisting of an argument and its dialectical penumbra.

Johnson's definition differs from the definition proposed in this chapter in at least two additional respects. It restricts arguments to actual discourses or texts

rather than considering them as abstract objects that may be unexpressed. And it requires that their authors have as their purpose to persuade an intended recipient to accept a thesis on the basis of the reasons supplied, whereas the definition proposed in the present chapter leaves undetermined the purpose for which someone might express an argument. In defence of the latter position, one might point out that it is possible to include an argument as part of a joke, or that scholars and scientists who make a case for some position in academic writing may be more concerned to get on the record a solid justification of the position than to actually persuade any particular person or persons to accept it. In general, then, there is a variety of purposes for which people express arguments.

Blair (2004) construes arguments as reasons for something: for beliefs or for believing, for attitudes or for emotions, or for decisions about what to do. A set of propositions is a reason for something if and only if they actually support it. Blair justifies his abstract conception by pointing out that arguments as we ordinarily understand them have many uses–not just persuasion, but also quasi-persuasion, inquiry, deliberation, justification, collaboration, rationale-giving, edification, instruction and evaluation. Hence it distorts our ordinary understanding of arguments to build into the definition of argument some particular purpose such as persuasion or the resolution of a conflict of opinion.

Blair's general approach of treating an argument as an abstract object that can be used for various purposes corresponds to the approach of the present chapter, as does his catholicity about the types of objects that can serve as conclusions of an argument. It differs from the approach of the present chapter in that it requires that the premisses of an argument actually support its conclusion, and indeed that none of the premisses is superfluous. He recognizes that people sometimes offer as a reason some consideration that does not in fact support the conclusion drawn from it. On his view, such people take themselves to be advancing an argument, but in fact they are not doing so. The term "argument" thus acquires a normative force, something like the force that the term "art" or "music" has in some people's usage. Blair's restriction of arguments to structures in which the premisses actually support their conclusion clearly departs from our actual use of the term "argument". Further, it is theoretically awkward, since informal logic deals with the identification, analysis, evaluation and criticism of inferentially bad arguments as well as inferentially good ones. What name then will Blair use for its subject-matter? The restriction of arguments to inferentially good ones appears to be motivated by Blair's treatment of an argument as a set, one of whose members is the conclusion and the rest of which are the premisses. Without a requirement that the premisses actually support the conclusion, every set of propositions would count as an argument–a classification clearly at odds with our ordinary usage. The present chapter avoids such an overly broad conception by treating a (simple) argument as a sequence, with an illative as well as premisses and conclusion. It also differs from Blair's conception in allowing complex arguments and in allowing an argument to be a premiss.

29.10 Exclusions from the Class of Arguments

Further clarification of the force of the definition of argument proposed in the present chapter should emerge from a consideration of the sorts of objects that the definition excludes as not being arguments.

First, not all persuasive communication counts as an argument in the sense defined. Students of persuasion commonly accept the distinction already pointed out by Aristotle (1984, *Rhetoric* I.2.1356a1-20) of a variety of means of persuasion: character, emotion, argument (in Greek *êthos*, *pathos*, *logos*). Presentation of oneself as having a certain character may enhance the credibility of what one says, but it is not an argument in the sense defined in the present chapter, since it lacks a premiss-conclusion structure. For the same reason, stirring up the emotions of one's audience is not in itself an argument, even though it may be more effective than argument at moving them, and even though it can be combined with argument. Talk of "ethotic argument" and "pathetic argument" blurs an important distinction among different means of persuasion. Similarly, not all advertising contains arguments. Some advertising, for example legal advertising, is purely informative. But even persuasive advertising often works by presenting the product or service in an appealing manner, by creating associations through visual imagery, or by providing detailed information about it. Only advertising with an explicit premiss-conclusion structure counts as an argument according to the definition of the present chapter.

Second, insinuation is not argument. Although someone who insinuates something invites the hearer or reader to draw a conclusion from their words, the words themselves do not draw that conclusion. One can of course identify and discuss the argument that the insinuator invites us to construct for ourselves. Typically, however, this argument is rather indeterminate, precisely because insinuation merely suggests.

Third, some visual, emotional, visceral and kisceral communication is argumentative. But some is not, even if it has a persuasive function. Images can supplement written words as part of an argument. The drawings of lines that accompany Euclid's proof that there are more primes than any given number of primes enhance one's understanding of the suppositions he makes and of the construction that is at the heart of the proof; they can be interpreted as a visual repetition of what is written in words. A diagram of an experimental apparatus serves a similar function of supplementing a parallel verbal description in the methods section of a scientific paper. Visual images can also function as ineliminable components of an argument. A poster with a giant photograph of a starving emaciated child and the words "make poverty history" can reasonably be construed as an argument in the sense defined in this chapter; its premiss is the situation exhibited in the photograph, whose information content has components that no purely verbal description can supply, and its conclusion is the directive of the written text. But visual images that merely suggest a conclusion to be drawn by the viewer are not arguments in the sense defined in this chapter, because they do not contain a conclusion. Similarly, emotional expressions can have a persuasive effect

without being part of an argument; for example, a conciliatory tone of voice may help persuade someone to calm down, but it is not part of an argument unless the speaker in so many words urges the addressee to calm down and states some reason for her or him to do so. Likewise with visceral communication; a threatening gesture may persuade someone to accede to some implied request, but it becomes part of an argument only when the gesturer says, "Your money or your life", or words to that effect. As for Gilbert's "kisceral" mode, it is debatable whether the intuitions or hunches to which it refers are communicative devices, as opposed to a type of evidence analogous to direct observation. Of course, a person may cite their intuitive feeling as a reason for a certain belief or decision, but in that case the premiss is the assertion that they have this feeling, rather than the feeling itself.

29.11 Second Summary

To sum up, this chapter has proposed a definition of an argument as a set of one or more interlinked premiss-illative-conclusion sequences. Such sequences can be interlinked either through chaining together, when the conclusion of one sequence is a premiss of another, or through embedding, when one sequence is a premiss of another. A premiss is an assertive, conceived as not necessarily asserted by anyone, and a conclusion is a speech act of any type, conceived as not necessarily performed by anyone or urged upon any addressee. In other words, arguments are abstract structures. When expressed, whether in language or in images or in physical behaviour, an argument invites its addressees to accept each conclusion on the basis of the acceptance of the assertives in its immediately supporting reasons.

29.12 Other Issues in Informal Logic

The following is a list of some questions about arguments investigated within informal logic, with some references to the relevant literature:

29.12.1 On Argument Identification

How can one determine whether there is an argument in a spoken discourse, written text or other human communication?

In particular, what is the difference between an argument and a causal explanation? How can one tell in particular cases whether an indicator word like *because* or *hence* is being used inferentially or causally or both?

29.12.2 On Argument Analysis

What are the components of an argument? The standard view, incorporated in the definition of argument in this chapter, is that a simple argument has two types of components, the premisses and a conclusion, possibly linked by an illative. An alternative to this view, widely adopted in the field of speech communication, is the model of Stephen Toulmin for the "layout of arguments" (Toulmin 1958), according to which a simple argument has six components: claim, data (later grounds), warrant, backing, modal qualifier, rebuttal. Another proposal, advanced by Rolf George (George 1983) on the basis of Bolzano's conception of consequence in his 1837 *Wissenschaftslehre* (1985-1989/1837), is that a fully specified simple argument has three components: premisses, conclusion, and variands; the variands are those parts of the premisses and conclusion that are subject to variation in determining whether the conclusion is a consequence of the premisses. Still another proposal, due to Johnson (2000), is that an argument has not only the premisses and conclusion of its "illative core" but also a dialectical tier in which the arguer responds to objections to and criticisms of the illative core and addresses alternative positions.

In what ways can two or more premisses offer direct support to a single conclusion? What test should be used to determine how the premisses of a multi-premiss simple argument support the conclusion? Beardsley introduced the concept of a *convergent argument* as one where "several independent reasons support the same conclusion" (Beardsley 1950, p. 19). For Beardsley, however, a reason could consist of several premisses working together. To mark an argument with such a multi-premiss reason, Thomas introduced the concept of a *linked argument*, defined as one that "involves several reasons [i.e. premisses–DH], each of which is helped by the others to support the conclusion" (Thomas 1977). Although the distinction seems intuitively clear, different authors have proposed different tests for determining whether a multi-premiss simple argument is linked or convergent, and these tests give different results from one another and in some cases from our intuitive judgments about particular arguments. Walton (1996a, pp. 109–150) distinguishes five types of tests and skilfully displays the different classifications that they produce for a number of cases of argument and the difficulties for each type of test. For simplicity, he defines these tests for a two-premiss simple argument, but the definitions can easily be extrapolated to simple arguments with more than two premisses. The (necessary and sufficient) conditions for a two-premiss argument to be linked are as follows:

> *Falsity/no support*: Each premiss by itself gives no support to the conclusion if the other premiss is false.
> *Suspension/insufficient proof*: Each premiss by itself gives insufficient support to prove the conclusion if the other premiss is suspended, i.e. taken as not proved or not known to be true.

Falsity/insufficient proof: Each premiss by itself gives insufficient support to prove the conclusion if the other premiss is false.
Suspension/no support: Each premiss by itself gives no support to the conclusion if the other premiss is suspended, i.e. taken as not proved or not known to be true.
Degrees of support: The premisses together make the overall strength of the argument much greater than they would considered separately.

A sixth test not mentioned by Walton is due to Vorobej (1994):

Type reduction upon elimination (TRUE): The argument is of a different type, with weaker support for the conclusion, if a premiss is eliminated.

A particularly difficult type of argument to classify as linked or convergent is what Walton (1996a, pp. 130–134) calls an "evidence-accumulating" argument, where each premiss by itself gives some support to the conclusion but the combination of premisses gives more support. An example is the accumulation of symptoms and signs supporting a physician's diagnosis of a particular patient. On some tests such arguments come out linked, on others convergent. Some authors (e.g. Snoeck Henkemans 1992) distinguish the *cumulative* support exhibited by such arguments as a third type distinct from either linked or convergent support. Vorobej (1995) notes that some two-premiss simple arguments come out linked if a given test is applied to one premiss and convergent if the test is applied to the other premiss; he calls these *hybrid arguments*.

What standard forms can be used to represent the structure of complex argumentation? One method, carried out in detail by Maurice Finocchiaro in his analysis of Galileo's *Dialogue Concerning the Two Chief World Systems* (Finocchiaro 1980) and found with variations in many textbooks, is to use a numbering system that indicates the support relationships claimed in the text—for example, C for the main conclusion; 1, 2 and so on for premisses offered in direct support of C; 1.1, 1.2 and so on for premisses offered in direct support of 1; and so on. Such numbered components can be indented to exemplify visually the support relationships, as in the following "standardization" of the argument quoted earlier in this chapter from the end of Book I of Plato's *Republic*:

1.1 A just soul and a just man will live well, and an unjust one badly.
1.2 Anyone who lives well is blessed and happy, and anyone who doesn't is the opposite.

1. Therefore, a just person is happy, and an unjust one wretched.
2. It profits no one to be wretched but to be happy.

C. Therefore, injustice is never more profitable than justice.

Such numbering systems can be extended to accommodate structures where an argument is a premiss. Another method is to use diagrams such as the box-arrow diagrams used in the present chapter or the diagrams in Toulmin's *The Uses of Argument* (1958). Software is available for constructing such diagrams: for example, Araucaria (Reed and Rowe 2005), Athena Standard (Rolf and Magnusson 2002) and Reason!able (van Gelder 2004).

What principles should be followed in extracting arguments from human communications and putting them in a standard form or diagram? In what respects can an analyst alter the content of an argument component, and why? What components in the text, e.g. repeated components, can an analyst delete, and why? What components can an analyst add, and why? In particular, under what circumstances does a communicated argument have an unstated "gap-filling" (Ennis 1982) premiss which the analyst can add? How is it to be determined what exactly is the unstated premiss in such a case?

Can the traditional division of arguments into deductive arguments and inductive arguments be defended, and if so on what basis? Are there arguments that fit into neither category, such as arguments by analogy, balance-of-considerations arguments (also known as pros and cons reasoning or conductive arguments [Wellman 1971, Govier 1987]), means-end reasoning, abductive reasoning (also known as inference to the best explanation), and the dozens of other types distinguished in the literature on argumentation schemes (Perelman and Olbrechts-Tyteca 1958, 1969; Ehninger and Brockriede 1963; Hastings 1962; van Eemeren and Grootendorst 1992, pp. 94–102; Kienpointner 1992; Walton 1996b; Grennan 1997, pp. 151–219)?

An influential tradition within informal logic construes arguments as advanced in dialogue, even when there is no actual intervention by an interlocutor. What types of dialogues are there? What is the function of each type, and what rules govern its participants? Hamblin (1970) proposed a discipline of "formal dialectic", within which he thought that the fallacies tradition could be made intellectually respectable. Van Eemeren and Grootendorst (1984, 1992, 2004) construe all arguments according to the normative model of what they call a "critical discussion". Walton and Krabbe (1995, p. 66) distinguish six main pure types of dialogue, each with its own goals: persuasion, negotiation, inquiry, deliberation, information-seeking, eristic. They propose detailed rules for two sub-types of persuasion dialogues: permissive persuasion dialogues and restrictive persuasion dialogues (Walton and Krabbe 1995. pp. 123–172).

29.12.3 On Argument Evaluation

What are the criteria for a good argument? Hamblin (1970, pp. 224–252) usefully distinguishes alethic, epistemic and dialectical criteria. To these alternatives, one should add rhetorical criteria, focused on effective persuasion (Wenzel 1980).

What objections can be raised to alethic criteria? Is truth of an argument's premisses even a necessary condition for it to be a good argument, let alone a sufficient one?

What objections can be raised to epistemic criteria? Is there a defensible set of epistemic criteria for a good argument? One epistemic approach, adopted by Goldman (1999), is to adopt a "veritistic" criterion for the goodness of arguments, according to which arguments are good insofar as they tend to lead to true

conclusions; this approach of course applies only to arguments whose conclusions are assertions. Another epistemic approach, adopted among others by Feldman (1994) and by Siegel and Biro (1997), is to adopt a justificatory criterion, according to which an argument is good insofar as its premisses justify its conclusion.

What objections can be raised to dialectical criteria? Does mere acceptance by an interlocutor of an argument's starting-points and inferences make the argument a good one?

What objections can be raised to rhetorical criteria? Can one defend a basically rhetorical approach to the evaluation of arguments?

On the definition of argument proposed in the present chapter, an argument is an abstract structure that can be used for different purposes. If the evaluation of an artefact is relative to the purpose for which it is being used, then the evaluation of an argument will also be relative to its use in a given context. What are the different uses to which human beings put arguments, and what criteria for a good argument does each such use imply (Blair 2004)?

On the argumentation schemes approach, each argumentation scheme has associated with it a set of "critical questions" that must be answered positively in order for an argument conforming to that scheme to be a good argument. How are these critical questions determined? What are the critical questions for each argumentation scheme? Does a satisfactory answer to the critical questions for a given argumentation scheme imply that the argument in question conclusively establishes its conclusion? Or is there still room for defeat of the argument by further information? For a given argumentation scheme, to what extent is there a burden on the author of an argument conforming to that scheme to show that there are positive answers to the critical questions for that scheme?

What types of defeaters are there? How is the status of an argument to be adjudicated as a sequence of various types of defeaters, defeaters of defeaters, and so on, is noticed?

To what extent is the author of an argument obliged to consider in a "dialectical tier" objections, criticisms and alternative positions?

What is a fallacy? As Hamblin (1970) correctly reports, the logical tradition assumes that it is a type of argument that merely seems valid. Hamblin himself proposed that the study of fallacies be made part of a new discipline that he called "formal dialectic". A fallacy would then be a violation of the rules of a formal dialogue game. This conception of a fallacy has been adopted in various formulations by van Eemeren and Grootendorst (1984, 1992, 2004), Hintikka (1987) and Walton (e.g. 1998). Walton has noted that fallacies often involve an illicit shift from one type of dialogue to another, typically into a quarrel where "anything goes". Krabbe has extended the consideration of a fallacy as a violation of the rules of a type of dialogue in which interlocutors are engaged, by developing "profiles of dialogue" that indicate among other things the way in which charges of committing a fallacy can be advanced and responded to (Krabbe 1992, 1999).

How are fallacies to be classified? If a fallacy is a mistake in argumentation of a certain type, presumably one's taxonomy of fallacies will correspond to one's criteria for a good argument; for example if the individually necessary and jointly

sufficient conditions for a good argument are acceptability of each premiss, relevance of each premiss to the conclusion drawn from it and sufficiency of the premisses in combination to support the conclusion (Johnson and Blair 1993, Freeman 1991, Govier 2005), then there will be three main types of fallacies: fallacies of unacceptability, fallacies of irrelevance, and fallacies of insufficiency.

How are individual fallacies to be analysed? In particular, are argumentative moves that have traditionally been stigmatized as fallacious sometimes legitimate? If so, under what circumstances? In a series of papers published between 1972 and 1982, and collected in (Woods and Walton 1989), John Woods and Douglas Walton used the tools of formal logics other than classical first-order logic to explain a number of argumentative moves traditionally thought to be always fallacious (*argumentum ad verecundiam*, *petitio principii*, *argumentum ad baculum*, *argumentum ad hominem*, composition, division, post hoc *ergo propter hoc*, *ad ignorantiam*, *argumentum ad populum*, equivocation, many questions) and to work out under what circumstances if any they in fact amounted to a fallacy. More recently, in a series of monographs and articles far too numerous to cite in full, Walton has used the approach of argumentation schemes and critical questions to distinguish legitimate from fallacious occurrences of such moves as arguing in a circle, appealing to popularity, and arguing against the person (see for example Walton 1998).

A fine selection of contemporary work on fallacies, along with some classic historical papers, can be found in Hansen and Pinto (1995).

29.12.4 On Argument Criticism

What principles should govern the expression of one's evaluation of an argument in the form of argument criticism? Johnson (2000, pp. 217–248) has proposed and argued for the following principles:

> *Principle of vulnerability*: To be legitimate, an argument must be vulnerable to criticism.
> *Principle of logical neutrality*: The critic should be clear about the nature of the criticism and should not pass off substantive criticism as logical criticism.
> *Principle of parity*: Any line of reasoning or argument that is legitimate for one party to use is legitimate for the other.
> *Principle of discrimination*: Criticisms of an argument should be balanced, kept in perspective, and integrated. Balance requires assessment of both strengths and weaknesses. Perspective requires that the discussion of an argument's problems focuses on the most important problems. Integration requires giving greatest emphasis to major criticisms.

29.12.5 On Argument Construction

What principles should govern argument construction? What practical advice can be given for constructing good arguments?

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Chapter 30
Critical Thinking as an Educational Ideal

Abstract Critical thinking arrives at a judgment on a question by looking back in a reasonable way at the relevant evidence; it is "reasonable reflective thinking focused on deciding what to believe or do" (Ennis). Its key component skills are those of clarifying meaning, analyzing arguments, evaluating evidence, judging whether a conclusion follows, and drawing warranted conclusions. An ideal "critical thinker" is open-minded and fair-minded, searches for evidence, tries to be well-informed, is attentive to others' views and their reasons, proportions belief to the evidence, and is willing to consider alternatives and revise beliefs. The process of thinking critically involves problem identification and analysis, clarification of meaning, gathering the evidence, assessing the evidence, inferring conclusions, considering other relevant information, and making an overall judgment. Critical thinking differs from the logical appraisal of arguments in extending beyond a single argument, having a creative component, and involving critical assessment of evidence. Any educational system should aim to teach the knowledge, develop the skills, and foster the attitudes and dispositions of a critical thinker: someone who thinks critically when it is appropriate to do so, and who does so well. It can do so either by infusion in subject-matter courses or through a stand-alone course. Each method has advantages and disadvantages; a combination is theoretically better, but hard to achieve. In a stand-alone course, one should adapt to one's situation, communicate the course goals, motivate one's students, use a checklist as a course framework, foster a critical spirit, prefer depth to breadth, use bridging, take advantage of salient issues, use real or realistic examples, pick one's examples with care, give students lots of guided practice with feedback, check for understanding, encourage meta-cognition, think about context, watch for empty use of technical terms, and design multiple-choice items carefully if one uses them.

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30.1 Historical Development of the Concept of Critical Thinking

30.1.1 John Dewey

The concept of critical thinking was first singled out just 100 years ago, by the American philosopher, John Dewey. In a book entitled *How we think*, first published in 1910, Dewey presented what he called "reflective thinking" as an "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends" (Dewey 1910, p. 6). For Dewey, such thinking arises in response to a suggested resolution of some specifically occasioned perplexity:

> If the suggestion that occurs is at once accepted, we have uncritical thinking, the minimum of reflection. To turn the thing over in mind, to reflect, means to hunt for additional evidence, for new data, that will develop the suggestion, and will either, as we say, bear it out or make obvious its absurdity and irrelevance… Reflective thinking, in short, means judgment suspended during further inquiry… (p. 13)

In essence, Dewey's reflective thinking is the systematic testing of hypotheses, i.e. what is sometimes called the scientific method. Reflective thinking in Dewey's original sense begins with the definition of a problem, often a problem of understanding why a certain phenomenon occurs. One or more hypotheses are proposed as possible solutions. Then some method of systematic observation or experiment is devised as a test of these hypotheses, and carried out. The results of this investigation are analyzed, qualitatively or quantitatively, and interpreted. Tentative conclusions may be reached, but are subject to testing by further experiments. Thus the primary focus of reflective or critical thinking in Dewey's sense is the consideration of hypotheses suggested as possible solutions to perplexities people face. What many people now identify as critical thinking—the scrutiny of arguments and assertions produced by others—is at best a minor part of reflective thinking thus conceived, an activity hardly mentioned in Dewey's book.

30.1.2 Edward Glaser

Inspired by Dewey, the Progressive Education Association in the United States promoted over the next 40 years what they called "critical thinking", a criterion used in the Association's landmark Eight-Year Study in the 1930s. Another outgrowth of the progressive education emphasis on critical thinking was the pioneering development by Goodwin Watson and Edward Glaser, starting in 1925, of the Watson-Glaser Critical Thinking Appraisal, a version of which lives on today as the Watson-Glaser II Critical Thinking Appraisal (Watson and Glaser 2009).

Glaser (1941) characterized "critical thinking" as including:

> an attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experience; knowledge of the methods of logical inquiry and reasoning; and some skill in applying these methods. Critical thinking calls for a persistent effort to examine any belief or supposed form of knowledge in the light of the evidence that supports it and the further conclusions to which it tends.

The last-quoted sentence uses almost the same words as Dewey's definition of "reflective thinking". Glaser specified this basic conception with a list of abilities, including those involved in systematic problem-solving. A guide to teaching critical thinking in the social studies published the following year likewise identified the components of critical thinking in terms of the elements of problem-solving.

30.1.3 1940s Through 1960s

The first introductory textbook with the word "critical thinking" in its title appeared in 1946 (Black 1946); its subtitle was "an introduction to logic and scientific method".

About a decade later, Smith (1953) gave the concept of critical thinking an appraisal-only sense somewhat more limited than Glaser's conception:

> Now if we set about to find out what … [a] statement means and to determine whether to accept or reject it, we would be engaged in thinking which, for lack of a better term, we shall call critical thinking.

Influenced by this conception, Ennis (1962) defined critical thinking in a landmark paper as "the correct assessing of statements". Ennis identified 12 aspects of this activity and gave criteria for their correct performance. In keeping with the linguistic focus of much of the Anglo-American philosophy of the time, Smith and Ennis reformulated as statements the "belief or supposed form of knowledge" which Dewey and Glaser took to be the starting-point of reflective or critical thinking.

30.1.4 1970s and 1980s

In North America, the 1970s and 1980s saw an explosion of educational interest in critical thinking, including a mushrooming of college and university courses in "informal logic" or "reasoning", which were conceived as alternatives to introductory symbolic logic courses. With this explosion of interest came new conceptualizations of critical thinking:

- the appropriate use of reflective scepticism within the problem area under consideration (McPeck 1981).
- using the standards of reason in deciding what to believe and what to do (Hitchcock 1983).

- reasonable and reflective thinking that is focused on deciding what to believe or do (Ennis 1985, 1996).
- skillful, responsible thinking that facilitates good judgment because it relies upon criteria, is self-correcting and is sensitive to context (Lipman 1988).
- thinking (and acting) which is appropriately moved by reasons (Siegel 1988).
- disciplined, self-directed thinking that exemplifies the perfection of thinking appropriate to a particular mode or domain of thinking (Paul 1989, 1993).

None of these conceptions is an appraisal-only sense of critical thinking. In particular, Ennis has abandoned his earlier restriction to appraisal, partly to reflect the way the term 'critical thinking' is used, partly because the skills involved in correctly assessing statements overlap extensively with those involved in deciding reasonably and reflectively what to believe or do. Another change in the 1980s was increased attention to the attitudes and dispositions of a critical thinker; previous conceptions had focused almost exclusively on skills.

30.1.5 The 1990 Statement of Expert Consensus

In 1990 Peter Facione presented to the Committee on Pre-College Philosophy of the American Philosophical Association a statement of expert consensus on critical thinking for the purposes of educational assessment and instruction (Facione 1990). This report was the fruit of a two-year Delphi process involving 46 experts in critical thinking, including psychologists and educational researchers as well as philosophers. They agreed to characterize critical thinking as:

> purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based… (Facione 1990, p. 3)

The report specified the core skills and sub-skills constitutive of the kind of judgment described in this general characterization. It added a list of mental habits of the "ideal critical thinker" (such as being inquisitive, open-minded, orderly, focused and persistent) that has much in common with Ennis' list (1985, 1991) of the dispositions of the ideal critical thinker. Like the definitions from the 1980s quoted above, the experts' consensus eschews an appraisal-only sense of critical thinking. Indeed, it includes among critical thinking skills categorizing situations, decoding graphs and paraphrasing statements, as well as the more familiar skills of devising testing strategies, formulating alternative solutions or hypotheses, judging the acceptability of premisses and inferences, and drawing conclusions.

30.1.6 Fisher and Scriven

More recently Alec Fisher and Michael Scriven have devoted an entire monograph to the definition and assessment of critical thinking. They define critical thinking as the "skilled and active interpretation and evaluation of observations, communications, information and argumentation" (Fisher and Scriven 1997, p. 21). The assessment of critical thinking was the subject of an earlier monograph by Norris and Ennis (1989).

30.2 The Definition of Critical Thinking

What are we to make of this confusing sequence of apparently competing definitions? First, we should not be surprised by the apparent absence of consensus. New domains are normally the subject of numerous definitions before a broad consensus is reached.

30.2.1 Commonalities and Differences Among Rival Definitions

Second, amid the variety, we can detect considerable commonality:

- Critical thinking is a type of thinking.
- It applies to all subject matters.
- It involves reflection, looking back, suspending judgment.
- Good critical thinking is reasonable.
- Critical thinking involves a careful consideration of evidence.
- Critical thinking is oriented towards making a definite judgment.
- The ideal "critical thinker" thinks critically whenever it is appropriate.
- Being a critical thinker involves knowledge, skills, attitudes, and dispositions (behavioral tendencies).

We can also detect certain key differences:

- Some conceptions (Dewey 1910; Glaser 1941; Smith 1953; Ennis 1962; Hitchcock 1983; Fisher and Scriven 1997) treat critical thinking as concerned only with the appraisal of already existing intellectual products (such as hypotheses, statements, and arguments), whereas others (Ennis 1985, 1987, 1991; Paul 1989, 1993) treat it more generally as applying also to the creation of intellectual products (such as solutions to problems, explanations of perplexing phenomena, decisions in complex situations, and answers to difficult questions).

- Some conceptions (Glaser 1941; Ennis 1962; Hitchcock 1983) focus on skills, others (Paul 1982, 1993) emphasize attitudes, still others (Ennis 1985, 1987, 1991, 1996; Siegel 1988) emphasize both.
- Some conceptions (Glaser 1941; Ennis 1962, 1987, 1996; Paul 1993) treat at least some aspects of critical thinking as highly general, whereas others (McPeck 1981) treat critical thinking as necessarily subject-specific.

There are also differences about the role and importance of deduction in critical thinking, about the tolerance of imprecision, and about the relationship between critical thinking and the logical analysis of arguments.

30.2.2 Component Skills and Attitudes

Third, the important thing is not the general definition, but the specification of standards. Hence, it is more useful to look beyond the definitions to descriptions of critical thinking skills and of the attitudes and behavioral tendencies of a "critical thinker". The most developed conceptions of the component skills of critical thinking have been advanced by Glaser (1941), Ennis (1987), Facione (1990), Fisher (2001), and Fisher and Scriven (1997). Ennis (1962, 1987) and Facione (1990) have provided elaborate descriptions of sub-skills. Despite differences, their lists have in common the following component skills of critical thinking:

- Clarify meaning
- Analyze arguments
- Evaluate evidence
- Judge whether a conclusion follows
- Draw warranted conclusions

A critical thinker not only possesses critical thinking skills but also exercises them when (and only when) it is appropriate to do so. Such tendencies are called dispositions, and they are reflected in a person's mental attitudes. The most developed published conceptions of the dispositional and attitudinal components of a critical thinker have been advanced by Glaser (1941), Ennis (1996), and Facione (1990). Their lists have in common the following dispositional and attitudinal characteristics of a critical thinker:

- Open-minded
- Fair-minded
- Searching for evidence
- Trying to be well-informed
- Attentive to others' views and their reasons
- Proportioning belief to the evidence
- Willing to consider alternatives and revise beliefs

30.2.3 Assessment: Criteria and Standards

A list of component skills and attitudes is not yet a set of standards. There must be criteria for the possession of each skill or attitude and standards for meeting each criterion in a satisfactory way. Of the authors just mentioned, only Ennis (1962) has produced even criteria, let alone standards. But Watson and Glaser (2009), Ennis and Millman (2005) and Facione (1998, 2000) have produced standardized tests of critical thinking skills which implicitly provide criteria. And Fisher has developed an examination in critical thinking which thousands of secondary school students take in the United Kingdom each year in order to obtain a General Certificate of Education in Critical Thinking (Oxford, Cambridge and RSA Examinations 2011); his monograph (Fisher 2001) serves as a textbook for the course leading to this examination. Each of the standardized tests has norms derived from previous administrations of the test, which can be used as the basis for at least comparative standards. The four tests use multiple-choice items to test the following skills (the number in parentheses being the number of tests with such items):

- evaluation of inferences from given statements to a given conclusion (4)
- identification of an assumption implicit in a given statement or argument (4)
- clarification of meaning (3)
- evaluation of the credibility of a statement (2)
- analysis of the structure of argumentation in a passage (2)
- evaluation of what follows from given information (1)
- judgment of how to evaluate a given claim (1)
- identification of fallacies (1).

Of the four tests, the Cornell Critical Thinking Test Level Z is the most comprehensive. The General Certificate of Education in Critical Thinking (Oxford, Cambridge and RSA Examinations 2011) differs from the other three tests in having a written component. It focuses on evaluating reasoning of different kinds and on presenting arguments.

30.2.4 Relation to the Logical Analysis of Arguments

Is critical thinking synonymous with the logical analysis of arguments? The logical analysis of arguments certainly covers many core critical thinking skills. But critical thinking skills go beyond logical analysis to include such things as the evaluation of evidence and searching for additional information. In this respect, critical thinking is broader than the logical analysis of arguments. On the other hand, critical thinking comes into play only with "judgment suspended during further inquiry", to quote Dewey's original formulation. Much reasoning and argument is routine; an example is working out a simple problem in arithmetic or algebra. In a field of expertise like medicine or law or accounting, critical thinking occurs only

occasionally, for example, when a physician has to make a differential diagnosis or a lawyer tries to make sense of conflicting precedents similar to a case under review. Also, critical thinking typically involves consideration of many arguments, whereas logical analysis applies to single arguments. Hence, if we were to make an Euler diagram of logical reasoning and argument on the one hand, and critical thinking on the other, the two circles would overlap. Some, but not all, logical analysis of argument is critical thinking. And some critical thinking, but not all, is logical analysis of argument.

In thinking critically, we not only want to find out if a single piece of reasoning or argument is good or bad. We also want to know more about its context and see it in a broader framework of alternative choices, ways or options. We want to trace the best path towards our understanding of a problem and make the best decision about it. We also look at the extent to which all our judgments and decisions are supported by evidence while examining as well the quality of this evidence.

The key to developing critical thinking skills and dispositions is to become aware of how we think and to work consciously at improving our thinking with reference to some model. This conscious drive to improve involves an overall assessment of our own thinking, a 'thinking about our own thinking', commonly known as meta-cognition (Fisher 2001). In minimal meta-cognition, one is aware that one is engaging in a certain kind of thinking, such as judging whether a reported correlation supports a causal claim. An advanced form of meta-cognition organizes the thinking by consciously engaging in a strategy, such as considering alternative explanations in terms of a third causal factor, reverse causation or coincidence. Meta-cognition is at its most reflective when one reflects upon the way one is thinking and considers how to improve it (Swartz and Perkins 1990, p. 52).

30.2.5 The Process of Thinking Critically

A list of skills and attitudes, even if accompanied by criteria and standards for their attainment, gives little guidance on how to deploy the skills and attitudes included in the list when one thinks critically about a particular problem, hypothesis or argument. For this purpose, a checklist provides a helpful framework. Such checklists can be found in some writings about critical thinking, for example Hitchcock (1983), Ennis (1996) and Jenicek and Hitchcock (2005). Hitchcock (1983) uses the acronym OMSITOG to summarize a seven-component model:

1. Get an OVERVIEW of the message.
2. Clarify MEANING.
3. Portray STRUCTURE of argumentation, if any.
4. Check whether INFERENCES are sound.
5. Evaluate the TRUTH of claims not supported by argument (assess the evidence on which conclusions are based).
6. Consider OTHER relevant evidence and arguments.

7. GRADE the message.

Ennis (1996) uses the acronym FRISCO for his six-component model:

1. Identify the FOCUS: the main point or main problem.
2. Identify and evaluate the relevant REASONS.
3. Judge the INFERENCES.
4. Attend to the SITUATION: aspects of the setting, which provide meaning and rules.
5. Obtain and maintain CLARITY in what is said.
6. Make an OVERVIEW of what you have discovered, decided, considered, learned and inferred.

Jenicek and Hitchcock (2005) identify seven components of the critical thinking process, which they describe as a form of problem-solving:

1. *Problem identification and analysis*: The problem (the main question or the main point) is identified and if necessary broken up into component parts.
2. *Clarification of meaning*: The meaning of terms, phrases and sentences is clarified where necessary. This component includes clarification of the problem to see how it should be investigated, as well as operationalization of key terms in an investigation.
3. *Gathering the evidence*: Evidence relevant to the problem is obtained.
4. *Assessing the evidence*: The quality of the evidence is judged.
5. *Inferring conclusions*: Conclusions are drawn from the best evidence, or inferences drawn by others are evaluated.
6. *Other relevant information* is considered: possible exception-making circumstances, situational factors, implications of one's tentative conclusions, alternative positions and their justification, alternative explanations of results, possible objections and criticisms, etc.
7. *Overall judgment*: Some sort of overall judgment on the problem is reached, taking into account all the components of the critical thinking process.

These seven components and related questions, which Fisher (2001) termed a 'thinking map', should be regarded as a checklist rather than a sequence. A given critical thinking process can jump around from one point on the checklist to another, and back again. For example, it may be necessary to clarify meaning at more than one stage of the process.

Let us look in detail at the seven components of the critical thinking process identified by Jenicek and Hitchcock.

In *problem identification and analysis*, we identify the central focus of our critical thinking. It may be a problem or question, either open-ended or restricted to specified alternatives. It may be a hypothesis suggested as an explanation of some phenomenon. It may be the main conclusion of an array of connected arguments.

Sometimes, a problem is so vast that it needs to be 'atomized', broken into component parts that can be separately treated. Such an analysis of a complex problem is part of the critical thinking component of identifying the focus.

Identifying and analyzing the problem naturally are found at the beginning of a critical thinking process. Sometimes, however, it is necessary to come back to this component in order to reformulate the problem or analyze it differently (or for the first time). And it is important throughout the critical thinking process to maintain one's focus on the central problem or thesis, so as not to wander off into irrelevancy.

For further evaluation and an eventual judgment, we must *grasp the meaning* of the problem. If we are thinking critically about an article in a medical journal, for example, we should ask if it is a description of an observation, a comparison of two or more sets of observations to explore some cause-effect relationship, a comparison of two or more groups in a controlled experiment or clinical trial to study treatment effectiveness, a search for factors of good or bad prognosis in an experimental or observational study, or a comparison of alternative treatment methods. The nature of the problem, as determined by the answer to our question, will determine what kinds of reasoning and argument are relevant.

Clarification of meaning goes beyond classifying the problem and inferring the appropriate method of investigation. It can involve clarification of terms and concepts used in the statement of the problem or in any part of the evidence, reasoning, or argument brought to bear on it. An important component of clarifying meaning in an evidence-gathering critical thinking process is to operationalize vague terms such as 'depressed' or 'feeling tired'. Although clarifying meaning comes naturally at the beginning of a problem-solving type of critical thinking, it can occur at any stage of a critical thinking process.

Besides clarifying the meaning of the problem as a focus of study, we must also elucidate its logical 'architecture'. Reasoning is thinking directed to a conclusion. It must be rooted in premisses that are not themselves conclusions of previous reasoning. These may be assumptions, established scientific theories, and the like. But they will often include data, i.e. primary observations. Such observations are the *evidence* on which our thinking should be based.

If the critical thinking is critical appraisal of an array of already produced arguments, the evidence will be the data reported in the ultimate premisses of these arguments. In that case, the task of gathering evidence is primarily one of analyzing the structure of the arguments in the text being appraised, so as to identify their ultimate premisses. It may also be necessary to gather evidence not included in the arguments under consideration, as a means to assessing their quality and overall result.

If the critical thinking is reflective thinking about an open problem, gathering evidence will involve conducting the sort of study indicated by the classification of the problem at the stage of clarifying its meaning.

Once we have identified or gathered our evidence, we need to *assess its quality*. The ultimate premisses relevant to the critical thinking problem must be checked to determine if they are true, by seeing whether they are justified. General claims would typically receive their justification from well-designed analytical studies, perhaps graded according to some standard hierarchy, such as that of evidence-based medicine. Particular claims typically rest on observation, whether immediately or through the interpretation of data as information.

A logician will focus mainly on the quality of the inferences involved, but for comprehensive critical thinking, evidence is equally important. Good evidence must complement good inferences.

Besides assessing the evidence, we must *determine what follows* from it. If we are critically appraising an array of arguments, our question is whether each inference in the array is justified. Is the path from the premisses to the conclusion right? Do the premisses really lead to the stated conclusion? Are premisses and conclusions held strictly within a pre-defined problem and question? According to an approach due to the philosopher of science Toulmin (1958), the basic question is whether there is a justified warrant that applies to the inference from premisses to conclusion in each single argument. If the warrant is not universal, but only presumptive or probabilistic, a further question is whether there are exceptions (contraindications, rebuttals) in the particular case that dictate a rejection of the inference (and perhaps of the conclusion).

If we are engaging in constructive critical thinking in which we ourselves are gathering evidence, we must use justified warrants in drawing conclusions from our good evidence. These warrants must be kept in mind in designing the systematic observation or experiment in which the evidence is gathered. Thus, when critical thinking involves gathering evidence, the inferential component both precedes and follows the evidence-gathering and evidence-assessing components.

One way in which critical thinking goes beyond the logical appraisal of a single argument or piece of reasoning is to look to *other considerations* which are not mentioned in a text being critically appraised, or not explicitly part of gathering and assessing evidence and drawing inferences from it. In designing a study of some question, these other considerations will include a critical review of the relevant peer-reviewed literature. In evaluating the inferences in an array of existing arguments, they will include attention to possible exception-making circumstances (rebuttals). They also include consideration of challenges that could plausibly be raised regarding the conclusion one wants to draw—e.g. other possible explanations of the data one has gathered, objections to and criticisms of one's premisses or inferences, situational factors that put the evidence in a new light. The implications of the conclusion may also need to be taken into account, as Dewey pointed out in his original 1910 definition of reflective thought. We may ask if our conclusions are probable in the light of other well-established information ('knowledge'). We may also be interested in whether our conclusions confirm or improve our existing understanding of the problem. Finally, we may be asking ourselves if our conclusions provide some new insight into the problem of interest.

Finally, the critical thinker must *take a stand* on the main question or problem. If it is a question of what to believe, some judgment (possibly qualified) should be reached on the basis of all the components of the critical thinking process. If it is a question about what to do, some decision should be made on what is the best path among all the options under consideration.

Here it is worth noting that, if a critical appraisal finds serious flaws in an array of arguments for some conclusion, it does not necessarily follow that this conclusion is false. Showing a premiss to be false or an inference to be unsound does not establish

the falsehood of the conclusion. Someone can accidentally stumble on the truth by reasoning badly from a false premiss, as when someone reasons that Wuhan is in China because it is the capital of Outer Mongolia. The moral of this example is clear: If in your critical thinking you determine that an argument has a bad premiss or a bad inference (or both), you have not thereby shown that the conclusion is false. You have only shown that this argument does not establish its truth.

It would be desirable to complete a critical thinking process by some sort of grading of how well the process was conducted. Some summary of the correctness or incorrectness of all the above-mentioned components of the critical thinking process has to be made. Is the overall process good or bad? What are its strongest and weakest points? For the moment, however, there is no directional categorical scale to score a particular critical thinking analysis of a given problem.

If we compare the critical thinking process as just described to logical appraisal of an argument, we can identify three major differences:

1. Critical thinking extends well beyond a single argument.
2. There is a creative component represented by proposing and evaluating alternatives as well as choosing the best of them.
3. Critical thinking involves critical assessment of evidence itself. The critical assessment, selection, use, and evaluation of evidence are part of any evidence-based approach, be it in medicine or elsewhere.

30.3 Critical Thinking as an Educational Ideal

30.3.1 The Case for Educating Students to Think Critically

In my view, it should be a goal of any system of education to teach the knowledge, develop the skills, and foster the attitudes and dispositions of a "critical thinker": someone who thinks critically when it is appropriate to do so, and who does so well. The ability to think critically, in the sense just described, is an important life skill. Everybody encounters from time to time perplexities about what to believe or what to do, both in everyday life and in specialized occupations. Skillful critical thinking is by definition more likely to lead to a satisfactory resolution of such perplexities than inadequate reflection or a knee-jerk reaction. A disposition to respond to perplexities with skillful critical thinking is thus helpful to anyone in managing their life. Furthermore, although most people develop some disposition to think critically and some skill at doing so in the ordinary course of their maturation, especially in the context of schooling, focused attention on the knowledge, skills and attitudes of a critical thinker can improve them noticeably. For example, in a study of the effectiveness of computer-assisted instruction in critical thinking (Hitchcock 2004), I found that, at the beginning of a critical thinking course, on a standardized test of critical thinking skills the average score of several hundred

undergraduates who had already completed at least one year of university courses was 17 out of 34. At the end of the course, the average score on this standardized test had risen to 19 out of 34, a gain of half a standard deviation, enough to be noticeable, and far more than the expected gain of 0.05 of a standard deviation (Pascarella and Terenzini 2005). Other studies have found even greater average gains from taking a course in critical thinking, ranging as high as 1.5 standard deviations. Such results point to just one respect in which explicit instruction in critical thinking can make it better. More generally, a student can improve thinking of any sort in six different respects: awareness, effort, attitude, organization, sub-skills and smoothness (Swartz and Perkins 1990, p. 24). For all the reasons just mentioned, it makes sense to make critical thinking an explicit goal of any educational system, and especially of any system of post-secondary education.

30.3.2 Ways of Developing Critical Thinking

How can this goal be achieved? Three points need to be made at the outset. First, it is not enough just to list critical thinking as the goal of an educational program or of an educational institution. Something must be done consciously to see that the education provided actually fosters critical thinking. Second, although educational reform should be motivated by a vision of a critical thinker as an ideal to be striven for, it should be recognized that in practice any educational system can only hope to move its students closer to this ideal. Not every student will reach it. Third, all the critical thinking skills in the world will get you nowhere without content knowledge of the domain about which you are thinking. That does not mean, of course, that domain knowledge is enough. One needs to apply the strategies and skills of a critical thinker to the domain knowledge in question.

There are two pure models for incorporating the enhancement of thinking in an educational program (Swartz and Perkins 1990, pp. 67–128). One model is infusion, where the strategies, skills, dispositions and attitudes of a critical thinker are developed in the context of subject-matter instruction. A unit in a history course, for example, might be an occasion for teaching categorical syllogistic and using the system of enthymemes associated with it to identify assumptions implicit in the reasoning of key argumentative texts from the period. The other pure model is stand-alone instruction, in the form of a separate course in critical thinking, using everyday examples that do not require advanced subject-matter knowledge. One can combine these pure models by having a stand-alone course that is reinforced by infusion in subject-matter courses. Infusion in subject-matter instruction has the advantage of ready-made domain knowledge as input to the critical thinking process. It faces a challenge of facilitating transfer of the skills and attitudes of a critical thinker from the subject-matter in question to other subjects and to the everyday life of the students. Separate instruction in critical thinking, in a dedicated course, can develop the skills and reinforce the attitudes across a wide range of subject matters, but faces the challenge that many students may have inadequate knowledge of the

subject-matter of some of the examples. Theoretically, therefore, a combination of infusion and separate instruction would seem ideal. However, such a combination is hard to achieve without a strong commitment of an educational institution, and especially its senior academic leadership, to teaching critical thinking across the curriculum. A combined approach would require adoption of a basic core of terminology and knowledge that could be amplified and adapted in various subject-matter courses, as well as developed in a separate course dedicated to teaching critical thinking. A successful example, in the neighbouring field of problem solving, is the integration in the chemical engineering program at McMaster University of courses in problem solving with content courses.

30.3.3 Teaching Critical Thinking in a Stand-Alone Course: Principles of Design

Let us suppose, however, that we are teaching critical thinking in a stand-alone course. What principles should guide the design of such a course? I propose to offer some tips. Since this chapter concerns critical thinking, I will provide a rationale for each suggestion, thus permitting critical appraisal of it.

(1) *No one right way*: There is no single right way to teach a critical thinking course. The design of the course is a means to an end, and the effectiveness of the chosen means is influenced by the background of the teacher, the background and abilities of the students, the resources available and other situational factors. Further, even when all these factors are specified, there may be more than one effective means for imparting the knowledge base, improving the skills and fostering the attitudes of a critical thinker.
Some jurisdictions specify quite prescriptively the content of a required critical thinking course. Since 1980, the state university system in California has required all students to pass a course in critical thinking before graduation, as part of its requirements for general education. The executive order 338 which mandated this requirement described it as follows:

> Instruction in critical thinking is to be designed to achieve an understanding of the relationship of language to logic, which should lead to the ability to analyze, criticize, and advocate ideas, to reason inductively and deductively, and to reach factual or judgmental conclusions based on sound inferences drawn from unambiguous statements of knowledge or belief. The minimal competence to be expected at the successful conclusion of instruction in critical thinking should be the ability to distinguish fact from judgment, belief from knowledge, and skills in elementary inductive and deductive processes, including an understanding of the formal and informal fallacies of language and thought. (Dumke 1980)

In my view, this statement is unduly prescriptive, and indeed incorporates questionable assumptions and distinctions. But it gives a good sense of what in general a critical thinking course might be expected to aim at.

(2) *Communicate goals clearly*: The goals of the course should be clear to the instructor and should be communicated to the students at the very beginning. The students have a better chance of achieving the goals if they and the instructors both know what they are and both know that the other knows what they are.

(3) *Motivate the students*: It is helpful if the students can acquire at the beginning a sense of the advantages to them of improving their critical thinking skills. One way to foster such an appreciation is to ask students to think of situations in which it would be helpful to think critically about a problem. A strong external motivation is the help that the course can give in writing tests of reasoning skills for admission to medical or law or business school.

(4) *Use a framework*: Use, and communicate to the students, an overall framework for the critical thinking process, like OMSITOG or FRISCO or the seven-component checklist in Jenicek and Hitchcock (2005). Such a framework puts the various skills into a coherent structure that students can use subsequently.

(5) *Foster a critical spirit*: The goals should include fostering the attitudes of a critical thinker as well as developing skills and imparting the required knowledge. Fostering a critical spirit is important, in order to avoid reinforcing the common human tendency to see the faults in others' views and ignore the faults in our own. As Swartz and Perkins (1990, p. 38) point out, we tend to produce flimsy rationales for our own position and to ignore the other side. To counteract this tendency, we need to work at understanding the reasons people have for adopting points of view contrary to our own, for example by investigating the best arguments on all sides of a given issue. In addition to fostering an attitude of open-mindedness, it is helpful in my view to try to increase the confidence of one's students in their own ability to reach reasoned judgments on complex and controversial issues. Giving them experience in this sort of exercise is a very helpful way to do so. Although it is hard to rest part of the grade for the course on development of the attitudes of a critical thinker, you can encourage their development. An important way of doing so is to model the critical spirit yourself, for example by being open to challenges to your own expressed opinions and arguments or by examining sympathetically different perspectives on a controversial issue under discussion. Another way of developing the attitudes of a critical thinker is to assign tasks that require students to articulate a point of view opposite to their own, with the supporting arguments for that position.

(6) *Prefer depth to breadth*: If you have a choice between an ambitious agenda that you may have to rush through and a less ambitious agenda that you are sure the students can manage, choose the less ambitious agenda. It is no use "covering" an extra topic if most of the students don't learn much about it. One can put this suggestion in the form of the paradox: Less is more. In other words, if you have fewer topics, the students will learn more. An important decision in selecting your goals is whether to focus on reactive critical thinking that appraises others' statements and arguments or to develop

constructive critical thinking in the context of solving unstructured problems and making complex decisions (Swartz and Perkins 1990, pp. 111–114). Despite the need to have realistic goals, it may be wise to work from the broader conception of critical thinking that includes the construction of arguments. If we look at other kinds of skilled performance, such as crafts and athletics, we can readily see that developing the skill of doing it oneself brings with it an ability to appraise the performances of others, but not vice versa. The same may be true of the skill of making reflective judgments and decisions in a reasonable way. A course teaching constructive critical thinking could include among its topics problem solving, decision making and finding good information (Swartz and Perkins 1990, p. 119)—topics missing from a course restricted to reactive critical thinking. However one restricts one's goals, it would be wise to let one's students know about the limitations of the course, so that they do not get the false impression that they are getting a thorough coverage of all the strategies and skills involved in critical thinking.

(7) *Use bridging*: Bridging is making links between the student's real-world experience outside the classroom and the experience inside the classroom. Bridging should go in two directions. First, bridge from what the students already know to what you are trying to teach in a particular lesson. A course in critical thinking should build on the critical thinking skills and critical spirit that students already have. It should seem like a natural development of their existing repertoire, not like something alien to them. Second, bridge from what you teach in a particular lesson to the students' activities outside the classroom, whether in their everyday life or in their other courses [as in the examples given by Swartz and Perkins (1990, pp. 123–126)]. Refining students' critical thinking skills and fostering a critical spirit is not much use unless students will bring to bear those skills and that spirit in situations outside the classroom. Bridging begins this process of transfer, and encourages it.

(8) *Use salient current issues*: Take advantage of salient controversial issues as focuses for critical thinking. For example, I was teaching a critical thinking course in September 2001 when four planes were hijacked in the United States and flown into the twin towers of the World Trade Center and into the Pentagon in Washington. This event and its aftermath provided an opportunity to show how various critical thinking skills could be brought to bear on the problem of terrorism. I prepared a page on critical thinking and terrorism, with links to relevant Web sites; it is still on the Web, at http://www.humanities.mcmaster.ca/~hitchckd/terrorism.htm (accessed 2016 08 02). Relating critical thinking to an event like the September 11 attacks that grips the attention of all your students is an effective way to demonstrate the relevance and usefulness of what they are learning.

(9) *Use real or realistic examples*: It is easy to spend a lot of time on skills that are not really very useful in thinking through complicated problems or critically appraising the views and arguments of others. In textbooks, a sign of such irrelevance is that the exercises are artificial and do not correspond to anything

that one would be likely to encounter in real life. A check on usefulness is to use real examples, or at least realistic ones. It can take a lot of time to find examples, although the World Wide Web has made that task much easier. You can enlist your students to help you, by assigning them tasks of finding examples, as part of bridging from the course to the real world.

(10) *Pick your examples with care*: You want examples on topics that are interesting, not just at the time but also four or five years from now when you use them in another offering of the course. Avoid examples on ephemeral issues that will soon cease to be of interest. Make sure that the examples are manageable, requiring for their analysis or evaluation only information that your students can reasonably be expected to have at their disposal. Make sure that the examples are of an intermediate level of difficulty for the skill that you are teaching with them, neither too easy nor too hard. In developing a skill, it makes sense to work from easier and more obvious examples to examples that are more difficult. Finally, pick examples from a variety of subject-matters, so that students see for themselves that the skills they are refining have quite general application.

(11) *Provide guided practice with feedback*: Make sure that the students get plenty of guided practice with feedback. The guidance will come from your instruction and from the textbook. The practice can take place in class, or in tutorials, or through homework. As reported in (Hitchcock 2004), I have found the computer-assisted tutorials developed by my colleague Jill LeBlanc quite helpful; they are available online at http://www.wwnorton.com/college/phil/lemur/ (accessed 2016 08 02). I have also found classroom response systems, colloquially known as "clickers", quite helpful, although one can fit only a few examples into a single class. Derek Bruff's *Teaching with classroom response systems: Creating active learning environments* (2009) is a useful guide to the use of this new technology.

(12) *Check for understanding*: Related to the previous point, check to see that the students understand what you are teaching them and can apply it. One way to do so is to display in class a multiple-choice item that tests a skill just taught, then ask students to vote for the answer they think best by a show of hands or with a classroom response system. A large percentage of incorrect answers indicates a need for further instruction, perhaps after hearing from those who answered incorrectly as to why they did so. Such immediate checking is particularly important in large classes, where one can lose the students without even realizing it.

(13) *Encourage meta-cognition*: Incorporate into your assignments encouragement of students to be aware of and direct their own thinking (Swartz and Perkins 1990, pp. 177–187). For example, you could ask students to recall a bad decision or incorrect judgment, then invite them to reconstruct the thinking that led to the bad outcome and find out if there was some mistake in it that they could avoid the next time they find themselves in a similar situation. Or you could have them articulate their thinking to each other in pairs as they work through an assigned task, with the listener recording the thinking process involved and reporting it back.

(14) *Think about context*: Be aware of the problem of inadequate context for thorough treatment of brief examples. There are various solutions to this problem. First, be receptive to alternative responses to examples by students who imagine a different context than the one you have on mind. Second, consider using a number of related examples that bear on a single issue, so that the required context can be provided; Swartz and Perkins (1990, pp. 120–121) mention as an example a course that used the debate over Harry Truman's decision to authorize dropping atomic bombs on Japan in 1945 as a focus for teaching decision-making strategies and critical thinking skills. Third, consider a writing assignment which requires gathering evidence and argument from a number of sources on the same issue, thus providing the required context.

(15) *Watch for empty use of technical terminology*: Discourage use of the technical terminology of the course as a substitute for actually engaging with the content of examples. In critiquing an argumentative passage, students should have something substantive to say about the content of the premisses on which its argument is based and about the strength of support they give to the main thesis. Give low marks for just saying that the premisses are dubious and the inference weak; your students need to explain what is dubious about the premisses and why the inference is weak.

(16) *Design multiple-choice items carefully*: If you are going to base the students' grades at least partly on multiple-choice items, put a lot of care into designing them well. Figure out first what it is important for your students to know or do, and then think about how to test their knowledge or ability through a multiple-choice format. Don't just take the line of least resistance of testing things for which it is easy to construct multiple-choice items. Use real or realistic examples in your items, to reflect the sort of tasks you want your students to be able to do. Check your items for soundness before using them on a test. I generally create a large pool of items and have five or six people with experience teaching critical thinking answer them independently, with any comments they care to make; surprisingly often, I have to throw out items because there is no consensus among the experts on the correct answer. This divergence is inevitable with items requiring judgment and evaluation. Check the performance of your students on each item you use, to see if the distribution of responses indicates something bad about the item, in which case you will need to make an adjustment to the mark. Keep a record afterwards of your students' performance, so that you know whether to use an item again. Ideally, about 70% of your students should get the correct answer, with the rest being distributed evenly among the distracters.

30.3.4 Resources on the Web

There are helpful resources about critical thinking on the Web. I recommend first the Web site on critical thinking developed by Robert Ennis, which you can find at www.criticalthinking.net. (accessed 2016 08 02). There are also links to useful sites on the Web site of the Association for Informal Logic and Critical Thinking (AILACT) at https://ailact.wordpress.com/ (accessed 2016 08 02). Finally, the philosopher Tim van Gelder of the University of Melbourne in Australia has a useful directory of quality online resources about critical thinking at http://austhink.com/critical/ (accessed 2016 08 02).

30.4 Summary

Let me summarize what I have said. I traced the development of conceptions of critical thinking over the past 100 years, since the publication in 1910 of John Dewey's *How we think*. From the somewhat bewildering sequence of definitions of critical thinking, I extracted the common thread that critical thinking is a type of thinking that is oriented to making a judgment on some question, and that does so by looking back in a reasonable way at the evidence relevant to the question. Critical thinking, in the apt formulation of Robert Ennis, is "reasonable reflective thinking focused on deciding what to believe or do" (http://www.criticalthinking.net/; accessed 2016 08 12). I noted three issues on which theorists of critical thinking divide: whether it is purely reactive or also constructive, how important to good critical thinking are skills as opposed to attitudes, to what extent there are generic critical thinking skills. I then noted some commonly recognized critical thinking skills: clarifying meaning, analyzing arguments, evaluating evidence, judging whether a conclusion follows, drawing warranted conclusions. And I noted some commonly recognized attitudes of an ideal "critical thinker": open-minded, fair-minded, searching for evidence, trying to be well-informed, attentive to others' views and their reasons, proportioning belief to the evidence, willing to consider alternatives and revise beliefs. I presented three checklists of components of the critical thinking process, and described the seven components of the checklist due to Milos Jenicek and myself (Jenicek and Hitchcock 2005): problem identification and analysis, clarification of meaning, gathering the evidence, assessing the evidence, inferring conclusions, considering other relevant information, overall judgment. Any such checklist is not necessarily a sequence; in a critical thinking process one can jump back and forth between various components of the checklist. On the basis of the conception of critical thinking thus developed, I argued that critical thinking overlaps with the logical appraisal of arguments, but is different from it in that it extends well beyond a single argument, has a creative component, and involves critical assessment of evidence. I then argued that it should be a goal of any educational system to teach the knowledge, develop the skills, and foster the

attitudes and dispositions of a "critical thinker", someone who thinks critically when it is appropriate to do so, and who does so well. I distinguished two pure methods of such instruction, infusion in subject-matter courses and offering a stand-alone course. I mentioned some advantages and disadvantages of each method, and argued that a combination was theoretically better than either by itself, although hard to achieve. Finally, I gave a number of tips on the design of stand-alone courses in critical thinking: adapt to your situation, communicate the course goals, motivate your students, use a checklist as a course framework, foster a critical spirit, prefer depth to breadth, use bridging, take advantage of salient issues, use real or realistic examples, pick your examples with care, give students lots of guided practice with feedback, check for understanding, encourage meta-cognition, think about context, watch for empty use of technical terms, design multiple-choice items carefully if you use them.

For an extended treatment of the issues discussed in this address, with valuable historical information and considerable agreement with my perspective, I recommend a two-part article by Robert Ennis in the journal *Inquiry* (Ennis 2011a, b).

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Chapter 31
The Effectiveness of Instruction in Critical Thinking

Abstract Studies have found only a small improvement in critical thinking skills in traditional stand-alone undergraduate critical thinking courses, moderate improvement when such courses involve computer-assisted tutoring or are combined with writing instruction and practice, and the largest improvements mainly in courses that focus on computer-assisted argument mapping. In addition, two recent meta-analyses suggest that the most effective method of improving critical thinking skills may be a unit of critical thinking instruction by a purpose-trained instructor in the context of subject-matter instruction with student discussion, engagement with a problem, and coaching.

Undergraduate instruction in critical thinking is supposed to improve skills in critical thinking and to foster the dispositions (i.e., behavioral tendencies) of an ideal critical thinker. Students receiving such instruction already have these skills and dispositions to some extent, and their manifestation does not require specialized technical knowledge. Hence it is not obvious that the instruction actually does what it is supposed to do.

In this respect, critical thinking instruction differs from teaching specialized subject matter not previously known to the students, for example, organic chemistry or ancient Greek philosophy or eastern European politics. In those subjects, performance on a final examination can be taken as a good measure of how much a student has learned.

A good examination of critical thinking skills, on the other hand, will not be a test of specialized subject matter. Rather, it will ask students to analyze and evaluate, in a way that the uninitiated will understand, arguments and other presenta-

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D. Hitchcock, *On Reasoning and Argument*, Argumentation Library 30,
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tions of the sort they will encounter in everyday life and in academic or professional contexts. Performance on such a test may thus reflect the student's skills at the start of the course rather than anything learned in the course. If there is improvement, it may be due generally to a semester of engagement in undergraduate education rather than specifically to instruction in critical thinking. There may even be a deterioration in performance from what the student would have shown at the beginning of the semester.

31.1 Measuring Instructional Effectiveness

We therefore need well-designed studies of the effectiveness of undergraduate instruction in critical thinking. An ideal design would take a representative sample of undergraduate students. It would then divide them randomly into two groups, an intervention group and a control group. The intervention group would receive the critical thinking instruction. The control group would receive a substitute that is assumed to have no effect on the outcomes of interest, an educational placebo. Otherwise the groups would be treated the same way. Each group would be tested before and after the instructional period by a validated test of the outcomes of interest. If the intervention group on average improves more than the control group, and the difference is "statistically significant," then the critical thinking instruction has in all probability achieved the desired effect, to roughly the degree indicated by the difference in average gains.

A similar design could be used to investigate whether one method of teaching critical thinking is more effective than another. The two groups would both receive instruction in critical thinking, but by different methods. If one group has higher mean gains than another, and the difference is statistically significant, then its method is probably more effective than the method used with the other group.

Practical constraints make such ideal designs impossible. Students register in the courses they choose. They cannot be allocated randomly to an intervention group and to a control group getting an educational placebo. Even random allocation to two groups exposed to different methods of instruction is difficult.

A standard design therefore administers to a group of students receiving critical thinking instruction a pre-test and a post-test using a validated instrument for testing critical thinking skills. For comparison, one can use a nonrandomized control group, such as a class of undergraduate students who are not receiving the critical thinking instruction but who are generally similar in other respects. With such a purpose-built control group, one can compensate for the likelihood that the control group does not perfectly match the intervention group at pre-test by controlling statistically for known differences that exist then. This approach allows for more robust inferences of causation than a simple pre-post design with no control group. An example of such a study is Facione (1990a), where the intervention

group consisted of students in 39 sections of courses approved as meeting a critical thinking requirement and the control group consisted of students in six sections of an introductory philosophy course.

A simpler design tests critical thinking skills before and after an instructional intervention, with no control group. In the absence of a control group, reported gains should be reduced by the best available estimate of the gains that the students would have made without the critical thinking instruction. Such gains would presumably be due to such factors as full-time university study, maturation, and familiarity with the test. Whatever the study design, statistically significant differences are not necessarily educationally meaningful. With large groups, even slight differences will be statistically significant, but they will not reflect much difference in educational outcome. Judgment is required to determine how much of a difference is educationally meaningful or important.

A rough estimate of educational significance can be provided by a statistic known as Cohen's *d* (Cohen 1988, pp. 24–27). To calculate this statistic, one needs an estimate of the standard deviation of scores on the test one is using in the "population" or "universe" to which one wishes to project one's results. (The standard deviation [SD] is a measure of the spread of scores around the mean, or average. A high SD means that the scores are widely spread, a low SD that they are bunched closely around the mean. One's "universe" should be the group from which one's "sample" has been selected. The sample should be representative of the universe in relevant respects.)

Cohen's *d* is a simple comparison of a difference (such as a difference in mean scores) to this standard deviation. One divides the difference by the standard deviation to get its quantity as a fraction of a single standard deviation. This fraction is commonly called the "effect size." In a simple pre-test, post-test design with no control group, if SD_t is the standard deviation on the test used and μ_{pre} and μ_{post} are the mean scores on the pretest and post-test respectively, then Cohen's *d* is given by the formula $(\mu_{post} - \mu_{pre})/SD_t$. For example, if the mean score on the post-test is 19, the mean score on the pre-test is 17, and the estimated standard deviation in the population is 4, then the effect size is (19 − 17)/4, or 0.5 SD—half a standard deviation. As a rule of thumb, a difference of half a standard deviation (0.5 SD) is a medium effect size. Norman et al. (2003) report that minimally detectable differences in health studies using a variety of measurement instruments average half a standard deviation. They explain this figure by the fact, established in psychological research, that over a wide range of tasks the limit of people's ability to discriminate is about 1 part in 7, which is very close to half a standard deviation.

Roughly speaking, a difference of 0.8 SD is a large effect size.

Besides giving a rough sense of educational significance of an intervention, Cohen's *d* has the advantage of allowing comparison of effect sizes in studies using different tests. The scoring system of a particular test drops out of the picture and is replaced by an effect size expressed as a fraction of a standard deviation.

31.2 Effectiveness of Computer-Assisted Instruction in Critical Thinking

With the widespread diffusion of the personal computer, and financial pressures on institutions of higher education, instructors are relying more and more on drill-and-practice software, some of which has built-in tutorial help. This software can reduce the labor required to instruct the students; at the same time, it provides immediate feedback and necessary correction in the context of quality practice, which some writers (e.g., van Gelder 2000, 2001) identify as the key to getting substantial improvement in critical thinking skills. In addition, well-designed software can enhance the intrinsic motivation that tends to promote learning more than external motivation (Lepper and Greene 1978). It does so by giving users optimal degrees of control, challenge, and stimulation of curiosity (Larkin and Chabay 1989).

Does the use of such software result in greater skill development, less, or about the same? Can such software completely replace the traditional labor-intensive format of working through examples in small groups and getting feedback from an expert group discussion leader? Or is it better to combine the two approaches?

Computational assistance can also reduce the labor of marking students' work. Can machine-scored testing, in multiple-choice or other formats, completely or partially replace human grading of written answers to open-ended questions? Answers to such questions can help instructors and academic administrators make wise decisions about formats and resources for undergraduate critical thinking instruction.

An opportunity to answer some of these questions came when face-to-face tutorials in a critical thinking course at McMaster University in Hamilton, Canada, were replaced with computer-assisted instruction with built-in tutorial help. The grade depended entirely on multiple-choice testing. To judge the effectiveness of the new design, the students' critical thinking skills were tested at the beginning and at the end of one offering of the course.

At the first meeting the course outline was reviewed and a pre-test announced, to be administered in the second class. Students were told not to do any preparation for this test. In the second class students wrote as a pre-test either Form A or Form B of the California Critical Thinking Skills Test (CCTST). There followed 19 lectures of 50 min each, that is, 15.8 h of critical thinking instruction. In the second-last class, students wrote as a post-test either Form A or Form B of the CCTST. The last class reviewed the course and explained the final exam format.

There were no tutorials. Two graduate teaching assistants and the instructor were available for consultation by e-mail (monitored daily) or during office hours. These opportunities were used very little, except just before term tests. The course could have been (and subsequently was) run just as effectively with one assistant. Review sessions before the mid-term and final examination were attended by about 10% of the students. Two assignments, the mid-term and the final examination were all in machine-scored multiple-choice format. There was no written graded work.

Students used as their textbook Jill LeBlanc's *Thinking clearly* (LeBlanc 1998), along with its accompanying software LEMUR (LeBlanc 2008),[1] an acronym for Logical Evaluation Makes Understanding Real. The course covered nine of the textbook's ten chapters, with the following topics: identifying arguments, standardizing arguments, necessary and sufficient conditions, language (definitions and fallacies of language), accepting premisses, relevance, arguments from analogy, arguments from experience, causal arguments. There were two multiple-choice assignments, one on distinguishing arguments from causal explanations and standardizing arguments, the other on arguments from analogy. The mid-term covered the listed topics up to and including accepting premisses. The final exam covered all the listed topics.

The software LEMUR consists of multiple-choice exercises and quizzes tied to the book's chapters, with tutorial help in the form of explanations and hints if the user chooses an incorrect answer. If the user answers an item correctly, there is often an explanation why that answer is correct. As readers can confirm for themselves, working one's way through the exercises provides immediate feedback that shapes one's future answers. One can observe oneself correcting one's misunderstandings and improving one's performance as one goes along.

LEMUR's argument standardization exercises have pre-structured box-arrow diagrams into whose boxes students can drag the component sentences of an argumentative text so as to exhibit its argument structure graphically. It is possible to construct original diagrams in more sophisticated software, such as *Athena 2.7* (Rolf and Magnusson 2002), Araucaria (Reed and Rowe 2012), and *Rationale* (van Gelder 2013, 2015).

There was a Web site for the course, on which answers to the textbook exercises were posted, as well as past multiple-choice assignments, tests, and exams with answers, along with other help. There was no monitoring of the extent to which a given student used the software or the Web site. To encourage students to do their best on both the pre-test and the post-test, 5% of the final grade was given for the better of the two marks received. If one of the two tests was not written the score on the other test was used, and if neither test was written the final exam counted for an additional 5%. In accordance with the test manual, students were not told anything in advance about the test, except that it was a multiple-choice test. A few students who asked what they should do to study for the post-test were told simply to review the material for the entire course. Students had about 55 min on each administration to answer the items, slightly more than the 45 min recommended in the manual.

The original intention was to use a simple crossover design, with half the students writing Form A as the pre-test and Form B as the post-test, and the other half writing Form B as the pre-test and Form A as the post-test. This design automatically corrects for any differences in difficulty between the two forms. As it turned out, far more students wrote Form A as the pre-test than Form B, and there were not

[1]The publisher has made the software available at http://www.wwnorton.com/college/phil/lemur/; accessed 2016 08 03.

enough copies of Form B to administer it as a post-test to those who wrote Form A as the pre-test. Hence the Form A pre-test group was divided into two for the post-test, with roughly half of them writing Form B and the rest writing Form A again. This design made it possible to determine whether it makes any difference to administer the same form of the test as pretest and post-test, as opposed to administering a different form.

Of the 402 students who completed the course, 278 wrote both the pre-test and the post-test. Their average score went from 17.03 out of 34 on the pre-test to 19.22 on the post-test, an increase of 2.19 points, which corresponded to half a standard deviation (0.49 SD, to be precise). Thus the course had a moderate "effect size." More detailed information about the results can be found in Hitchcock (2004), on which the present chapter is based.

It made no difference to the gain in average score whether students wrote the same form at post-test as at pre-test. Form B was slightly harder than Form A: the students who wrote Form B first and Form A second (the "BA" group) had a somewhat bigger average gain than those who wrote Form A first and Form B second (the "AB" group). [Jacobs (1995, p. 94, 1999, p. 214) also found that students did somewhat worse on Form B than on Form A.] The gain in average score among students who wrote Form A both times (the "AA" group) fell squarely in between the mean gains among the AB and BA students (see Fig. 31.1). Thus there was no difference between writing the same form of the test twice and writing a different form in the post-test. As the test manual reports, "We have repeatedly found no test effect when using a single version of the CCTST for both pre-testing and post-testing. This is to say that a group will not do better on the test simply because they have taken it before" (Facione et al. 1998, p. 14).

These results raise two main interpretive questions. First, how much of the improvement in test scores can be attributed specifically to the critical thinking instruction? Second, how does the improvement compare to the improvement after other ways of teaching critical thinking?

First, to determine how much of the improvement can be attributed to the critical thinking course, we need to subtract the improvement that the students would have shown if they had been taking some other course instead. Pascarella and Terenzini (2005) estimate, on the basis of a synthesis of studies done in the 1990s, that the first three years in college provide an improvement in critical thinking skills of about 0.55 of a standard deviation (SD). Most of the gains occur in a student's first year of college. They estimate the sophomore advantage over freshmen at 0.34 SD, the junior advantage over freshmen at 0.45 SD, and the senior advantage over freshmen at 0.54 SD. If we assume that in each year gains are distributed evenly between the two semesters, we can estimate that on average college students gain 0.17 SD in each semester of their first year in college and 0.05 SD in each subsequent semester of undergraduate studies. Hitchcock (2004) reports other evidence consistent with this estimate.

Almost all the students in the present study were registered in Level 2 or above. Thus they would be expected to improve their scores on a critical thinking test by 0.05 SD with a semester of full-time study that did not include a critical thinking

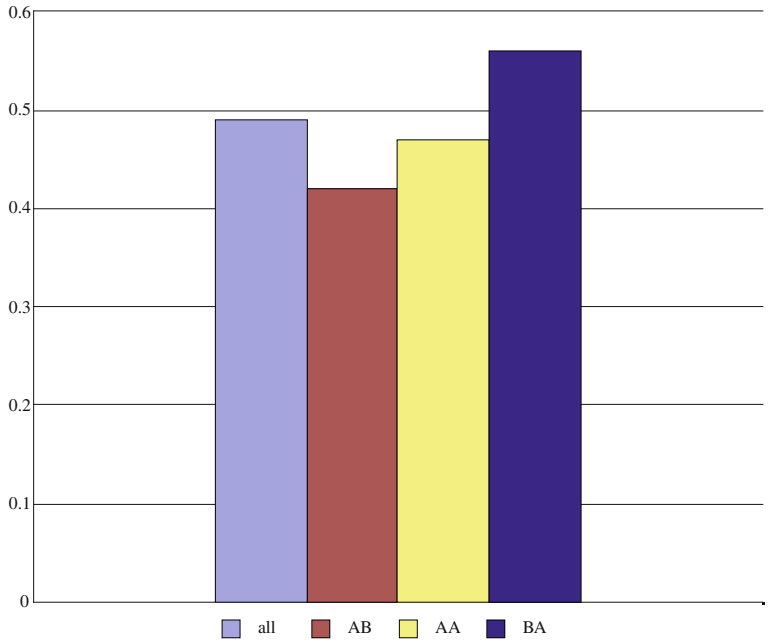

Fig. 31.1 Mean gain (in SD) by group in the McMaster study

course. So almost all their gain of 0.49 SD can be attributed to their computer-assisted critical thinking instruction−0.44 SD, to be exact. This is still close to a moderate effect size.

Second, similar studies, all of which used the CCTST, have found mean gains following a one-semester critical thinking course ranging from 0.32 SD to 0.89 SD (Hitchcock 2004). These studies investigated three different methods of critical thinking instruction.

Traditional design: An instructor teaches a small group (25–30 students) for a semester and marks assigned exercises. There are no tutorials and no computer-assisted instruction or marking. Assignments, tests, and exams require written answers, marked manually. Studies of this type of instruction show gains ranging from 0.28 SD (Twardy 2004) to 0.32 SD (Facione 1990a). Since the students in these studies are mostly beyond their first year, and so would be expected otherwise to show a gain of 0.05 SD, the gain attributable to the critical thinking instruction is about a quarter of a standard deviation, a small effect.

Full-year freshman course combining critical thinking and writing instruction: An instructor teaches critical thinking to a group of 20 students for seven weeks. Subsequently the group receives instruction in writing skills and writes a series of five essays. Studies of this type of instruction show gains ranging from 0.46 to 0.75 SD (Hatcher 1999, 2001, personal communication). Since freshmen can be expected to improve their scores by 0.34 SD during an academic year even without

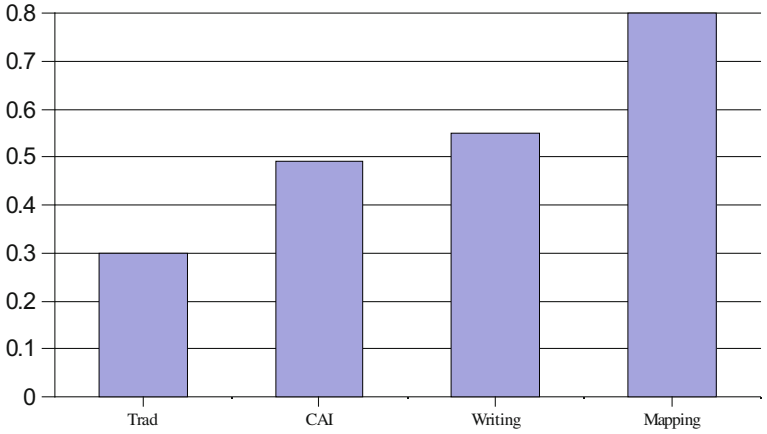

Fig. 31.2 Mean gain (in SD) by design

specific critical thinking instruction, the contribution of the critical thinking instruction in this design should be estimated at 0.12–0.41 SD, a small to moderately small effect.

One-semester freshman course using computer-assisted argument mapping: An instructor teaches methods of analyzing arguments to a large class (135 students in one case), with the students meeting in small tutorial groups (15 students on average) once a week. Almost the entire semester is devoted to argument mapping using computer assistance to produce box-arrow diagrams of argument structure. Studies of this type of instruction show gains ranging from 0.73 SD to 0.89 SD. Allowing for the expected gain otherwise of 0.17 SD in one semester of first-year undergraduate education, we can attribute to the critical thinking instruction in this design an effect of 0.56 SD to 0.72 SD, which is moderately large. If we amalgamate the results of these studies, as displayed in Table 1 of Hitchcock (2004, p. 188), we get the pattern displayed in Fig. 31.2. The highly efficient computer-assisted instructional design of the McMaster course is more effective than traditional critical thinking courses, about as effective as a freshman course combining critical thinking and writing, and less effective than computer-assisted instruction focused on argument mapping.

31.3 Comparative Effectiveness of Different Methods

Despite the optimism of such titles as "Why critical thinking should be combined with written composition" (Hatcher 1999) and "Argument maps improve critical thinking" (Twardy 2004), the studies just mentioned do not establish conclusively what instructional methods are most effective at improving the critical thinking skills of undergraduate students.

For one thing, the groups studied differ in many ways: the instructor's academic background and experience, the topics, the textbook, the feedback to students, the incentives for taking the pre-test and post-test seriously, the students' majors and levels of registration, their facility with multiple-choice tests, their academic ability, their critical thinking skills at pre-test, and so on.

For another, one can raise questions about the validity of the CCTST (Facione 1990a, b, c, d; Facione et al. 1998), that is, whether it really measures critical thinking skills. The CCTST is based on an expert consensus statement of the critical thinking skills that might be expected of college freshmen and sophomores (Facione 1990e). Its 34 items, however, test only some of the skills mentioned in this statement. There are also legitimate questions about the soundness of some of its items. Further, other conceptualizations of critical thinking, such as those of Ennis (1962, 1987, 1991) or of Fisher and Scriven (1997), imply a somewhat different set of critical thinking skills.

To address these concerns, which are described in detail in Hitchcock (2004), we need better validated tests of critical thinking skills. And we need studies like those described in this chapter with different groups of students receiving critical thinking instruction with different content from different instructors using different methods. Such studies should use a nonrandomized control group that permits a covariance analysis to control for differences at pre-test with the experimental group. They should report on the topics covered, the textbook used, the types of work used to determine the students' grade in the course (in particular, the balance between essay-type questions, short-answer questions, and multiple-choice items), class size, the instructor's relevant training and experience, the students' level of registration, the students' verbal and mathematical aptitude, the percentage of students whose mother tongue is not English, the instrument used at pre-test and post-test, incentives to do well on the pre-test and the post-test, and the stage of the course at which the post-test was given.

Useful guidance on exploring different instructional designs can come from a systematic meta-analysis by Philip Abrami and his colleagues (Abrami et al. 2015) of the effect of instructional interventions on generic critical thinking skills. As a measure of effect size, they modified Cohen's d to correct for bias in small samples. In 684 studies, with 867 effect sizes, they found an average effect size of 0.39. This low-to-moderate effect size suggests that it is possible to teach generic critical thinking skills.

For more detailed analysis, Abrami and his colleagues confined their attention to true experiments or quasi experiments where the particularities of the intervention could be confidently identified and standardized outcome measures with determinate reliability and validity were used. Also, studies were removed where the intervention was over a semester long. This collection of more methodologically sound studies included 341 effect sizes with a somewhat lower average of 0.30, with high heterogeneity. Effect sizes in these studies did not differ significantly by educational level, subject-matter, or duration of the intervention.

In an earlier preliminary meta-analysis of fewer studies, Abrami and his colleagues (Abrami et al. 2008) were able to account for 32% of the variance in effect

sizes by two features of the intervention: its pedagogical grounding and its type. The most effective type of pedagogical grounding, with an average effect size of 1.00, was special training of the instructor for teaching critical thinking. The most effective type of intervention, with an average effect size of 0.94, was a "mixed intervention" (Ennis 1989) combining subject-matter instruction with a unit devoted specifically to critical thinking. This type of intervention was also the most effective in the more recent meta-analysis (Abrami et al. 2015), but the average effect size of 0.38 did not differ significantly from the effect size with other types of intervention.

The more recent meta-analysis (Abrami et al. 2015) did not analyze their data by pedagogical grounding. Instead, they used a second set of instructional variables: dialogue, anchored instruction, and coaching. Dialogue involves learning through discussion. Anchored instruction (also called "authentic instruction") presents students with problems that make sense to them, engage them, and stimulate them to inquire. In coaching (also called "mentoring" or "tutoring"), someone with more expertise models a task to a "novice" with less expertise and then corrects the novice's errors based on critical analysis. A combination of all three of these strategies produced the highest effect size: 0.57, compared to 0.32 for a combination of anchored instruction and dialogue, 0.25 for anchored instruction alone, and 0.23 for dialogue alone.

Since these meta-analyses combined studies of interventions at various educational levels, their implications for undergraduate instruction in critical thinking are not straightforward. In particular, neither meta-analysis analyzed the results by whether the instructional design included argument mapping, which some studies of critical thinking instruction of undergraduates have shown to be particularly effective. But the meta-analyses suggest exploration of mixed designs with explicit teaching of critical thinking, in the context of subject-matter instruction, by an instructor specially trained for teaching critical thinking, where students engage in dialogue, apply the skills being taught to problems that engage them, and have some individual coaching. The substantial unexplained heterogeneity in both meta-analyses reinforces the need for further well-designed experimental and quasi-experimental studies in which the instructional strategies and instructor and student characteristics in the intervention and control groups are fully described.

31.4 Summary

One way to measure the effectiveness of an instructional intervention in improving critical thinking skills is to compare the mean gain of its recipients, on a validated test of critical thinking skills, to the mean gain of a control group. Studies of this kind have shown that traditional stand-alone undergraduate critical thinking courses tend to produce only a small improvement. There tends to be moderate improvement when such courses involve computer-assisted tutoring or are combined with writing instruction and practice. The largest improvements have been found mainly in courses that focus on computer-assisted argument mapping. In addition, two

recent meta-analyses suggest that the most effective method may be a unit of critical thinking instruction by a purpose-trained instructor in the context of subject-matter instruction with student discussion, engagement with a problem, and coaching.

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Chapter 32
Postscript

Abstract Informal logic is a newly self-conscious sub-discipline of philosophy that seeks to develop criteria, standards and procedures for the construction, identification, analysis, interpretation, evaluation and criticism of arguments. It is the philosophy of argument, or the philosophy of argumentation, and by extension the philosophy of reasoning. It overlaps with social epistemology and with applied epistemology, and is a significant part of philosophy, now recognized by the Fédération Internationale des Sociétés Philosophiques (FISP) under the label 'philosophy of argumentation'. An argument is a structure in which either one or more reasons are advanced for or against a claim or a conclusion is drawn from a set of premisses. A simple argument is a second-order illocutionary act in which one or more suppositives or assertives are adduced in support of or in opposition to an illocutionary act of any type. A complex argument is one built up from simpler arguments by chaining (when the conclusion of one argument is used as a premiss of another) or embedding (when one or more pieces of suppositional reasoning are adduced in support of a conclusion). Authors of arguments use them for various purposes. Critical thinking is a process of reflectively thinking about an issue with a view to reaching a reasoned judgment on what is to be believed or done. Education at all levels should aim to develop critical thinkers, i.e. people who think critically when it is appropriate to do so. The fundamental attitude of a critical thinker is a willingness to inquire, in fact a love of inquiry; derivatively, critical thinkers are fair-minded and open-minded, and they proportion the confidence they have in their beliefs to the strength of the evidence for them. The knowledge and skills required by a critical thinker come from formal logic, informal logic, cognitive psychology, epistemology, philosophy of science, statistics, and other disciplines. There is good evidence for the effectiveness of mixing explicit instruction in critical thinking with subject-matter instruction in a setting that includes student discussion, engagement with a problem, and coaching. This evidence is consistent with John Hattie's recommendation of "visible teaching" and "visible learning" in which teachers see how well their teaching is coming across and learners see how well they are learning.

D. Hitchcock, *On Reasoning and Argument*, Argumentation Library 30,
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The last part of the present collection contains thematic discussions of the fields of study to which the collected essays belong: informal logic and critical thinking. Informal logic is the philosophical study of argument, and by extension of reasoning. It has its own scholarly journal, *Informal Logic*, and its own scholarly association, the Association for Informal Logic and Critical Thinking (AILACT). Inclusion of the term 'critical thinking' in the association's name reflects a wish to connect with educational reform movements in the United States. Critical thinking is a type of thinking, nicely defined by Ennis (1991) as reasonable reflective thinking focused on deciding what to believe or do. It is a commonly recognized educational goal to develop "critical thinkers", i.e. people with the knowledge, skills, attitudes and mental tendencies of a person who thinks critically when it is appropriate to do so. Thus informal logic and critical thinking belong to different genera: informal logic is a branch of study and critical thinking is a type of thinking. They are related, in that informal logicians develop and debate some of the knowledge that critical thinkers need. Other sources of such knowledge are formal logic, philosophy of language, epistemology, philosophy of science, and cognitive psychology. The philosophical study of critical thinking is part of philosophy of education. Three of the essays reprinted in the present volume are contributions to that study: Chap. 25 on the place of the fallacies in teaching critical thinking, Chap. 30 on critical thinking as an educational ideal, and Chap. 31 on the effectiveness of instruction in critical thinking. The other reprinted essays are contributions to informal logic. Chapters 28 and 29 in particular address thematically what informal logic is.

32.1 "The Significance of Informal Logic for Philosophy" (2000)

"The significance of informal logic for philosophy" is a revised version of a paper prepared for a panel discussion at the World Congress of Philosophy in 1998 in Boston sponsored by AILACT. The chapter is largely descriptive of the contributions of informal logic to analysis of the concept of argument and to the development of norms for evaluating arguments. Along the way, it takes positions, some of which need correction.

First, the chapter treats all arguments as the product of an act of arguing. That is a mistake, at least if we take all communicated premiss-conclusion structures to be arguments. As the chapter itself points out, some communicated premiss-conclusion structures are just explanations of why the author holds a certain opinion, a function commonly indicated by hedging the conclusion with the phrase 'I think'. Others are a kind of thinking out loud, drawing an inference from information of which the author has just become aware, perhaps with a question to the addressee of whether the inference is correct. Others explain an already acknowledged general truth, or derive a novel prediction from a hypothesis under investigation, or exhibit an

inconsistency in the addressee's beliefs. Blair (2004, pp. 139–141) describes seven uses of arguments other than persuasion of the addressee: quasi-persuasion, inquiry and deliberation, justification, collaboration, rationale-giving, instruction, and evaluation. In none of these uses is the author arguing for the conclusion, i.e. making a case to the addressee for its acceptance.

Second, the chapter fails to acknowledge dissent from rejection of the soundness criterion of a good argument. Goldman (1997) and Allen (1998) endorse a distinction between logical and epistemological criteria for a good argument. On Goldman's account, an argument is a logically good argument if and only if its premisses are true and it is either deductively valid or inductively strong. Goldman contrasts this logical account with an epistemological account due to Feldman (1994), according to which an argument is epistemologically good for a person S if and only if "the conjunction of its premises are [*sic*] justified for the person, the person is justified in believing that the premises are 'properly connected' to the conclusion, and the argument is 'undefeated' for the person" (Feldman 1994, p. 155). Allen (1998) argues that there is a place in a theory of argument for both a logical and an epistemological conception of a good argument. If so, then the soundness of an argument, defined as being deductively valid and having true premisses, is a sufficient (though not necessary) condition for its being logically good in Goldman's sense. But soundness is neither necessary nor sufficient for an argument's being epistemologically good, even if the argument is deductively valid, since on the one hand a person can be justified in believing an untrue conjunction of premisses and on the other hand a person can fail to be justified in believing a true conjunction of premisses.

It is perhaps worth noting that a leading proponent of replacing truth by acceptability as the criterion of premiss adequacy, Johnson, subsequently argued (Johnson 2000, pp. 195–199) for retaining acceptability but restoring truth as an additional requirement, on the ground that theorists who replace truth with some other criterion of premiss adequacy continue to use it, either unofficially or implicitly or in their metatheory. Bondy (2010) however has argued convincingly within Johnson's framework for sticking with acceptability as the sole requirement for premiss adequacy. He begins by arguing, in agreement with Johnson, that the core purpose of an argument is to give its addressees good reasons for believing that its conclusion is true. Given this purpose, the addressees must have good reason to accept each premiss. Further, no more is required for premiss adequacy. The relevance of objections that a premiss is false or a set of premisses inconsistent, to which Johnson points, can be fully explained, Bondy argues, in terms of their contribution to showing that not every premiss deserves acceptance. The place of truth in a theory of argument evaluation is in its metatheory, i.e. the theory about the criteria that should be adopted for evaluating arguments. Given that the purpose of an argument is the rational persuasion of addressees of the truth of its conclusion, then one is obliged in discussing the appropriate criteria for evaluating an argument to use the concept of truth. But, as Bondy has himself exemplified, its use in the metatheory does not entail that truth is a requirement for premiss adequacy. Bondy's argument applies to any argument produced with the goal of giving its

addressees good reasons for believing that its conclusion is true. It can be adapted to such other goals of producing arguments as explaining one's reasons for holding a certain opinion, pointing out a consequence of positions taken by one's addressees, and so on.

A third position in the chapter that needs qualifying is its favourable attitude to a functional approach to developing criteria for evaluating arguments. Goodwin (2007) argued forcefully against such an approach. A functional account of argument norms, as Goodwin understands it, consists of three claims:

> (a) The context of an argument should be conceived as a joint activity.
> (b) The joint activity has the function of achieving a social good.
> (c) The norms of argument include those rules … an argument must follow … for the joint activity in which it is embedded to achieve its function (Goodwin 2007, pp. 70–71).

Thus the key features of the functional approach to which Goodwin objects are (a) the contextualization of argument in a certain kind of joint activity, (b) the postulation of some social good achieved by this joint activity as its function, and (c) the derivation of norms for argument from what the joint activity needs to serve this function. Goodwin attributes this approach not only to monistic theories like those of van Eemeren and Grootendorst (1984) and Johnson (2000) but also to pluralistic theories like those of Walton (1998). She objects to all three features of a functional account of argument norms. As to (a), the situation of arguments in one or more joint activities, she expresses "ontological doubts" (p. 74), finding the existence of arguments much more obvious than the existence of the joint activities that theorists postulate as their context. As to (b), the supposed function of the postulated joint activity, Goodwin asks for evidence that it has the social beneficial consequence attributed to it. She notes that argumentative exchanges can plausibly be construed as having various functions, as being dysfunctional, or as having consequences that are neither functional nor dysfunctional. On a pluralistic functional account, there is the additional problem of determining to which joint activity or activities a particular argument is to be assigned. As to (c), the derivation of norms of argument from the postulated function of the joint activity in which it is embedded, Goodwin notes that participants can reject the claim that norms for design of the joint activity bind their behaviour as individuals. Aside from this problem, she finds evidence lacking that adherence to a proposed set of norms is either a necessary or the most efficient and/or effective means of serving the postulated function. She notes the discovery in the social sciences of multiple patterns of culture that each manage to achieve a postulated goal, such as the socialization of children or the binding effects of religious practices.

As an alternative to a functional approach to crafting norms of argument, Goodwin proposes a design approach, consisting of the following three claims parallel to those constituting a functional approach:

a′ The determinative feature of the context of an argument is the talk in and through which the argument is made.
b′ A speaker so designs that talk as to create for the recipient(s) reason to respond as he desires.
c′ The norms of argument include those obligations (standards, ideals, etc.) that his argument must meet (live up to, realize etc.) in order for his talk to have force (Goodwin 2007, p. 85).

Goodwin's proposal is a species of a generic approach to generating argument norms from the author's purpose in producing an argument. That purpose may be one of giving a respondent reason to respond as the author desires. But it may have a much less other-dependent goal, such as showing anyone who cares to pay attention that some claim deserves to be accepted. The generic approach of deriving norms for arguments from the purposes of their authors has much to be said for it. First, the purpose or purposes of a given author in a given production of an argument are usually discernible, on the basis of such factors as the text or speech that surrounds it, the author's aims in the situation where the argument was produced, the author's explicit indications of purpose, and the socially expected and enforced norms of the institution in which the author advances the argument. Second, one can in principle work out as an exercise in means-end reasoning, according to the requirements for good reasoning of this sort laid out in (Hitchcock 2011), what qualities an argument should have to help it achieve this purpose. For example, if one is using an argument to make a joke, it should have qualities that will make the intended audience laugh, i.e. being obviously (to them) ridiculous and obviously not intended as a serious justification of the conclusion. Whether it actually gets a laugh depends not only on those qualities but also on the way it is delivered and the mood and mind-set of the hearers. Thus it might be a good argument even if it does not get a laugh, and conversely an argument that does get a laugh might do so by happenstance and not really be well designed as a joke. Similar remarks can be made about working out the qualities that an argument should have if it is to achieve some other purpose of the author in making the argument. Third, from the author's point of view an argument is a good argument if it has qualities that contribute effectively to achieving the author's purpose in producing the argument. One can of course legitimately evaluate arguments from other points of view, such as those of its addressees or of third-party evaluators. Thus we get a plurality of norms for argument, depending on whose perspective on the argument we take and what that person legitimately expects the argument to accomplish.

The chapter on the significance of informal logic for philosophy slid between the two functional approaches to developing norms for argument evaluation, one derived from a postulated function of the joint activity to which the argument belongs, the other derived from the author's purpose in producing the argument. Goodwin's powerful critique of the first sort of functional approach has led me to embrace the second one as an alternative.

A fourth possible inadequacy of the chapter is its rejection of premiss relevance as a distinct criterion for argument quality. Let us restrict our attention to arguments that are deductively valid, in the sense that the meaning of their constituents rules out that the premisses are true and the conclusion untrue. Now consider two plausible principles. First, if we take a deductively valid argument and switch the positions of a premiss and the conclusion while at the same time replacing each of them with its contradictory, the result will also be a deductively valid argument. For example, given that the argument 'snow is white; grass is green; so both snow is white and grass is green' is deductively valid, then so is the argument 'snow is white; not both snow is white and grass is green; so grass is not green'. Let us call this principle the '*principle of argument contraposition*'. Second, not everything follows from a contradiction. For example, the argument 'snow is white; snow is not white; so grass is green' is not deductively valid.[1] If we accept these two plausible principles, then there is reason to accept a requirement of premiss relevance for a good argument. Take any deductively valid argument that meets your other criteria for a good argument. Now add whatever statement you like as an additional premiss. Now switch this premiss with the conclusion while replacing each with its contradictory. Then, by the principle of argument contraposition, the new argument is deductively valid. But it has inconsistent premisses, in that their meaning rules out that all of them are true, and the conclusion may be any contradictory of any good premiss, contradicting the principle that not everything follows from a contradiction. For example, the following seems to be a good argument[2]:

(1) Maple trees are deciduous. So any leaf on a maple tree will fall to the ground within a few months.

The argument is deductively (though not formally) valid. Now add an irrelevant good premiss, say that Mars is a planet, so as to produce the following expanded argument:

(2) Maple trees are deciduous. Mars is a planet. So any leaf on a maple tree will fall to the ground within a few months.

Without a requirement that each premiss of a good argument must be relevant, the expanded argument (2) would also be a good one,[3] and would remain deductively valid. Then, by the principle of argument contraposition, the following argument is also deductively valid:

(3) Maple trees are deciduous. Some leaf on a maple tree will not fall to the ground within a few months. So Mars is not a planet.

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[1]This verdict requires modification of the definition three sentences ago of deductive validity, so as to require that the ruling out be non-trivial, i.e. not due either to the meaning ruling out that the premisses are true or to the meaning ruling out that the conclusion is untrue.

[2]Readers who find fault with it can replace it with another deductively valid argument that meets their standards for argument quality and transform it in a similar way.

[3]Readers who find fault with the added premiss can replace it with another irrelevant premiss that meets their standard of premiss adequacy.

But there is no reason to think that the conclusion of this argument follows from its premisses. To rule out such cases, we have to reject the principle that a deductively valid argument remains deductively valid if any premiss at all is added to it.[4] And one way to motivate the rejection of this principle is to require that in a good argument every premiss is relevant to the conclusion. Thus there may be a point to having a separate relevance requirement for a good argument.

Since the chapter was written, psychologists have found further evidence that people do not reason in accordance with the highly abstract schemata of formal logic. Experimental results cited by Dutilh Novaes (2012, pp. 125–127, 131–138) indicate that people often interpret unqualified conditional statements as defeasible and often base their judgment of whether a conclusion follows on its plausibility rather than the argument's logical form. Unlike the reasoning mentioned in the chapter that accords with conditional obligation and permission schemata, such cognitive biases cannot be accommodated by evaluating inferences in terms of substantive argument schemes rather than formal rules of inference. But there may be a case for legitimizing in certain contexts reasoning from "preferred models", i.e. a combination of a person's representation of a situation with what can be reasonably expected to occur in that situation (Dutilh Novaes 2012, p. 143).

If informal logic is a sub-discipline of philosophy, namely the philosophy of reasoning and argument, where does it fit in the accepted classification of branches of philosophy? The Fédération Internationale des Sociétés Philosophiques (FISP) now lists philosophy of argumentation as the 57th of 99 sections to which one can submit papers to world congresses of philosophy.[5] That seems an appropriate place to submit a paper in informal logic. As for critical thinking, it would seem most appropriate to submit papers concerning it to the section on philosophy of education, the 65th of FISP's 99 sections.

Mark Battersby has however argued (Battersby 1989) that critical thinking should be viewed as applied epistemology, a field of study that he sees as related to epistemology in the same way as applied ethics is related to ethics. Just as the flourishing of applied ethics has brought to light many new problems worthy of philosophical investigation, so the conceptualization of critical thinking as applied ethics can bring to light many new problems in applying general normative principles of epistemology to particular cases, such as the nature of justification and the evaluation of testimony. His proposal draws attention to important philosophical problems in applying general epistemological norms. However, as he himself acknowledges (p. 98), many components of critical thinking courses are not exercises in applied epistemology. Further, informal logic, which Battersby identified with critical thinking, goes beyond applied epistemology. Applied epistemology is a proper part of informal logic, and a proper part of the philosophical

[4]My argument for this position is inspired by reflection on the reason why Hellenistic Stoic logicians regarded an argument with a redundant premiss as deductively invalid (Hitchcock 2005).

[5]See the first circular for the 24th World Congress of Philosophy, to be held in Beijing on 13–20 August 2018, at https://www.fisp.org/documents/WCP%202018%20First%20Circular%20English.pdf; accessed 2016 08 07.

basis for teaching critical thinking. But it should not be identified either with informal logic or with critical thinking.

Goldman (1997, 1999) on the other hand treats the philosophy of argument as a part of social epistemology. Certainly much human knowledge is socially rather than individually acquired, and argument is one way of getting it. Thus the study of argument is indeed part of social epistemology. On the other hand, people use arguments for many purposes other than justifying assertions or producing knowledge. Hence the philosophy of argument extends beyond social epistemology. It deserves the recognition in its own right that FISP has granted it.

32.2 The Concept of Argument

"Informal logic and the concept of argument" was written in 2005 as an invited chapter for a volume on the philosophy of logic in a multi-volume handbook on the philosophy of science. This chapter was the only one devoted exclusively to informal logic in a volume of more than 1200 pages (There was a chapter on the relation between formal and informal logic.). Given the context, it seemed reasonable to start by saying what informal logic was: the area of logic which seeks to develop standards, criteria and procedures for the identification, analysis, interpretation, evaluation, criticism and construction of arguments. This definition opened up a natural division of the chapter into sections, but it seemed appropriate first to say what an argument is.

This task proved more difficult, more time-consuming, more space-consuming, and more energy-consuming than one might have imagined. In the end the chapter consisted almost entirely of a proposed recursive definition of an argument, with a section at the end reviewing issues and significant contributions in the components of informal logic. This last section has been included in the present reprinting as a useful reference to issues and approaches in informal logic.

The chapter's recursive definition of argument attracted a careful critical review by Geoffrey C. Goddu (2010) and his commentator Freeman (2010) at the 2009 conference of the Ontario Society for the Study of Argumentation. Each of them proposed a modification of the chapter's definition, Goddu's directed at securing what he took to be the present author's desired outcomes and Freeman's at distinguishing argument as a product from the process of arguing, a distinction first articulated by Wenzel (1979). Their objections were very much to the point. As a result, I have rethought the definition. To be comprehensible, I propose to follow the sequence of the original article, indicating briefly where I still maintain what it said and elaborating on how and why I now think differently. Thus the present section of this postscript should be understandable as a self-contained unit without the need to refer back to the original article for clarification.

The article began by noting that English seems to be peculiar in using the same word 'argument' in two distinct senses, which I called the reason-giving sense and the disputation sense. Informal logic is concerned with the reason-giving sense, in

which one speaks for example about John Searle's Chinese room argument or the five arguments of Thomas Aquinas for the existence of God. I now think, however, that it was a mistake to treat the verb 'arguing' in one of its two senses as coordinate with the noun 'argument'. To argue for some claim is to try to justify or establish it to one's addressees, and the product of this attempt is indeed an argument. But not all arguments are products of arguing. A common device in spoken arguments, for example, is to hedge the claim for which one is offering an argument with a phrase like 'I think'; this device occurred more than once in a sample of some 39 arguments discovered by random selection methods in telephone calls to radio and television talk shows (Hitchcock 2010). Speakers who qualify their claims in this way are most plausibly interpreted as explaining why they hold the opinion they do, rather than as trying to justify or establish their claim to their addressees. The qualification 'I think' is an expression of diffidence, of not being so presumptuous as to suppose that the reasons that have convinced the speaker will necessarily be persuasive to others. Another way in which people produce arguments is to point out to an interlocutor a consequence of the interlocutor's assumptions. In such cases, the author of the argument may not personally accept the consequence, and indeed may regard it as absurd. Blair (2004) has catalogued a variety of uses of argument other than those of trying to justify or establish a claim to an addressee.

Hence the initial informal definition of an argument as "a type of discourse in which the author expresses a point of view and offers one or more reasons in support of that point of view" (Hitchcock 2007, p. 103; p. 451 above) was unduly narrow. It was also defective in another way, in that it characterized the act of producing an argument rather than the argument produced. The word 'argument' as we ordinarily use it in everyday communication in its reason-giving sense does not refer to the speaking or writing out of a complex structure of a certain kind, but to the structure produced by the speaking or writing. If someone makes an argument as part of a scholarly or scientific presentation and subsequently publishes the same argument in a peer-reviewed article, there is only one argument.[6] Thus it would be better to say that an argument is the sort of thing that can be produced by expressing a point of view and offering a reason or reasons in support of it. One should hasten to add that there are other ways of producing an argument.

There is yet a third respect in which the initial informal definition of an argument was defective. It counted as arguments only structures in which the reason or reasons are offered as support for a claim. It thus excluded objections and criticisms, which are just as much arguments as are supports. The monk Gaunilon, for example, objected in the 11th century to Anselm's ontological argument for the existence of God that by the same reasoning one could prove the existence of a perfect island (Anselm 1903). Gaunilon's objection is an argument against the cogency of Anselm's argument. It would involve needless and misleading subtlety to recast his objection as an argument in support of some claim. Better to follow a

[6]I owe this insight to my colleague Wilfrid J. Waluchow, who pointed it out in response to a talk I gave to the McMaster philosophy department in January 2016.

number of authors who have recognized that there can be arguments against as well as arguments for, i.e. attacks as well as supports (Johnson 2000; Rahwan et al. 2007; Freeman 2010; Wohlrapp 2014).

Finally, it is useful to note the difference between a structure in which one or more reasons are given for or against some claim and a structure in which some conclusion is drawn from a given set of premisses. Purely dialectical reasoning, in which one draws conclusions from the commitments and concessions of an interlocutor, is more accurately described in the second way than in the first.

Accommodating the aforementioned four deficiencies produces a revised initial informal definition of argument as *a structure in which either one or more reasons are advanced for or against a claim or a conclusion is drawn from a set of premisses*.

Like its predecessor, this informal definition raises the question of what sorts of entities can function as reasons or premisses and what sorts can function as claims or conclusions. The chapter addressed this question by considering, with the use of Searle's taxonomy of illocutionary acts (Searle 1979), what types of illocutionary acts can function as reasons or premisses and what types can function as claims or conclusions. It argued by means of examples that only assertives can function as reasons or premisses, but that any type of illocutionary act can function as a claim or conclusion: not just an assertive, but also a directive, a commissive, an expressive or a declarative. It failed to make room, however, for the use of suppositions as premisses or reasons, a use that the chapter later allows for in the case of suppositional reasoning (Goddu 2010, p. 10). Such suppositional reasoning is common in "what-if" modeling of possible future scenarios and in counterfactual historiography, and occurs in arguments for conditional claims, in the inductive step of proofs by mathematical induction, in proofs by cases, and in universal generalizations from an arbitrarily chosen instance. Its premiss-conclusion structure makes it a kind of argument. To accommodate such arguments, Searle's taxonomy needs to be supplemented by a sixth main type of illocutionary act, which we might call suppositives, whose species include supposing, assuming or pretending (Goddu 2010, p. 10). The point of such acts is to lay something down as a basis for drawing conclusions, without committing oneself to its truth.

These same points about the types of illocutionary acts that can count as reasons or premisses on the one hand and as claims or conclusions on the other hand apply to structures in which reasons are offered against something rather than for something. It should be noted that the targets of supporting or attacking reasons include inference claims, i.e. the claims that are implicit in giving reasons for or against something.

An important point made in the chapter is that the claims and reasons in an argument need not be expressed verbally. They can be communicated by images, gestures, facial expressions, and the like.

The chapter went on to endorse Robert Pinto's characterization of arguments as "invitations to inference" (Pinto 2001). We can accept this characterization within the present framework if we broaden Pinto's conception of inference as a mental act in which someone draws a conclusion from premisses. We need to allow that the

conclusion drawn may inherit a suppositional status from a suppositional premiss in the argument and that the conclusion may be rejection of a target rather than acceptance of it.

The chapter then extended the class of arguments to include arguments entertained mentally but not expressed, as well as merely potential arguments. These extensions are no longer necessary, since arguments as now defined are not necessarily externalized. If an argument is a structure in which one or more assertives or suppositives are adduced[7] as supporting or opposing an illocutionary act of any type, one can meaningfully talk about arguments entertained in thought but not externally expressed and about arguments neither entertained in thought nor expressed. There are infinitely more such arguments than those that are thought and expressed.

The chapter introduced the notion of an equivalence class of arguments, i.e. a class of arguments equivalent in meaning to one another. The introduction of this notion was motivated by the conception of an argument as a kind of discourse, in the clearest case one whose structure as a second-order illocutionary act is signaled by an illative, i.e. a premiss indicator like 'since' or a conclusion indicator like 'so'. With the present shift to thinking of an argument as the content of this kind of discourse, it is no longer necessary to introduce the notion of an equivalence class as part of the definition of an argument. The question is no longer whether two arguments are equivalent in meaning to one another, but whether two pieces of discourse contain the same argument. That question does not need to be addressed as part of developing a definition of argument.

The chapter summed up its reflection with a definition of a simple argument, i.e. one in which there was a single inference from premiss(es) to conclusion. That definition needs to be replaced in the light of the changes mentioned so far. A simple argument should be understood as *a second-order illocutionary act in which one or more suppositives or assertives are adduced in support of or in opposition to an illocutionary act of any type*.

As the chapter pointed out, not all arguments are simple. One way to get complex arguments, it pointed out, is to use the conclusion of one argument as a premiss of another. Since simple arguments are now being conceived as second-order illocutionary acts, such a chaining of arguments can no longer be conceived, as the chapter conceived it, as a union of two sets. A better way is to conceive of it as a more complex act of adducing. We can thus frame a recursion clause allowing for the chaining of arguments as follows: *An illocutionary act is an argument if in it the conclusion of one argument is used as a premiss of another*. This formulation allows for indefinitely long chains of reasoning to count as single arguments.

In his critique of the chapter's definition of argument, Goddu (2010) identified two unwelcome consequences of its recursion clause permitting the chaining of

[7]The word is taken from (Bermejo-Luque 2011), without necessarily subscribing to that work's account of this second-order illocutionary act.

arguments. It made two independent arguments for the same conclusion into one argument if a further conclusion was drawn from that conclusion. Also, it made two conclusions drawn from the same set of premisses into a single argument if one of those premisses was in turn argued for. The new recursion clause appears not to have those unwelcome consequences. Even if it does, the result would merely be some inelegance when one came to evaluate such arguments, in that one might be led to say that one part of the argument was satisfactory but the other was not. Evaluation is neater if one can treat such cases as involving two distinct arguments to be evaluated separately rather than a single complex argument.

The chapter used the last few lines of Book I of Plato's *Republic* as an illustration of the chaining of arguments together. The box-arrow diagram illustrating the structure and content of the argument can stand, except that I would now follow the convention of the Argument Interchange Format (AIF; Rahwan et al. 2007) in putting a node on each edge indicating use of the premisses to support the conclusion drawn. In cases where one or more reasons are used to object to some claim, the graph of the reasoning would have a node just before the arrow indicating use of the reason(s) to attack the claim. The present definition however differs from the AIF in not making it part of an argument to specify the scheme being used to support or attack a claim.

As the chapter also pointed out, complex arguments can arise in one other way, by embedding a piece of suppositional reasoning in a more complex structure. Such embedding typically involves discharge of a supposition. In a general definition of argument, however, it is not necessary to specify the forms of reasoning that involve discharge of suppositions.[8] It seems appropriate, however, to note (as the chapter did not) that such embedding occurs only with arguments with a suppositional premiss, which we might call *suppositional arguments*. We can then allow for embedding of arguments by means of the following recursion clause: *An illocutionary act is an argument if in it one or more pieces of suppositional reasoning are adduced in support of a conclusion*.

The chapter quoted Euclid's proof that there is no largest prime number and Anselm's argument for the existence of God as examples of single arguments with embedded suppositional reasoning. Euclid's proof is particularly striking, in that there is a triple embedding: a reductio ad absurdum inside one half of a proof by cases inside a generalization from an arbitrary instance. Anselm's argument (in its English translation) uses conditional proof. It would be possible to add an example of proof by mathematical induction, where the inductive hypothesis is a supposition. The box-arrow diagrams of Euclid's proof and Anselm's argument can stand, again with the modification of adding a node on each edge before its arrow indicating that the relation is intended to be one of supporting.

A more comprehensive illustration of the graphical representation of arguments would include some examples of objections or criticisms.

[8]I am following here a suggestion of my colleague Richard T. W. Arthur in response to a talk that I gave to the McMaster philosophy department in January 2016.

In his critique of the chapter's definition of argument, Goddu (2010) pointed out that the embedding clause failed to provide for simple embedding, where the suppositional reasoning was used by itself to draw a further conclusion, without any additional premiss. The present embedding clause remedies this failure.

By putting the above italicized clauses together and adding a closure clause, one gets the following revised definition of an argument:

1. A simple argument is a second-order illocutionary act in which one or more suppositives or assertives are adduced in support of or in opposition to an illocutionary act of any type.
2. An illocutionary act is an argument if in it the conclusion of one argument is used as a premiss of another.
3. An illocutionary act is an argument if in it one or more pieces of suppositional reasoning are adduced in support of a conclusion.
4. Nothing is an argument unless it can be constructed in a finite number of steps using the above clauses.

It is perhaps worth noting the similarities and differences between the preceding definition and the earlier definition in the chapter. Some important similarities are as follows:

- Both definitions are recursive, with a base clause or clauses, two recursion clauses, and a closure clause.
- The premiss(es) and conclusion of a simple argument are taken to be illocutionary acts of certain types, not propositions, not sentences, and not mere locutionary acts such as utterances of sentences.
- The recursion clauses provide for two ways of making complex arguments out of simpler ones, by chaining and by embedding.
- Neither definition says anything about the purpose of putting forward an argument, thus leaving room for pluralism about people's goals in putting forward arguments and about the internal point of the second-order illocutionary act of adducing.
- Both definitions leave open the issue of criteria for evaluating arguments.
- Both definitions leave room for bad arguments.
- Neither definition imposes restrictions on the means by which an argument can be expressed, thus making room for components of arguments to be images, gestures, facial expressions, and other non-verbal means of communication.
- Both definitions allow for arguments to be merely thought about rather than expressed.
- Neither definition restricts the authorship of arguments to human beings, thus allowing that non-human animals or software agents can produce arguments.
- Neither definition requires the author of the components of an argument to be one and the same agent, thus allowing for example for dialectical argument in which one agent uses the commitments or concessions of another to draw a conclusion, as well as for supports of or attacks on another agent's claim that do not explicitly accept or reject it.

Some important differences are as follows:

- The earlier definition treated a simple argument as a set of token symbol-strings[9] semantically equivalent to a benchmark symbol-string with an illative. The present definition treats a simple argument as an abstract object in which the first-order illocutionary acts that constitute its premiss(es) and conclusion are bound into a whole by a second-order illocutionary act of adducing.
- The earlier definition used the presence of an illative (i.e. a premiss indicator or a conclusion indicator) as the primary basis for attributing an illative relationship to a thought-process, discourse or text. The present definition makes no reference to illatives, but instead rests the attribution of an illative relationship on an agent's performing the second-order illocutionary act of adducing. It says nothing about criteria for attributing this act to thinkers and communicators.
- The earlier definition treated a simple argument as a set of semantically equivalent actual symbol-strings (or equivalent communicative devices). The present definition treats an argument as an abstract object that may have any finite number of concrete realizations, from zero up.
- The earlier definition required the premisses of simple arguments to be assertives, whereas the present one allows them to be either assertives or suppositives.
- The earlier definition restricted arguments to symbol-strings where a set of reasons is offered in support of a claim. The present definition counts the offering of reasons against a claim as an argument.
- In the earlier definition, the clause permitting chaining of arguments implied that in certain cases two independent arguments for a single conclusion would be part of a single argument and two conclusions drawn from the same premiss would be part of a single argument. The chaining clause of the present definition avoids this unwelcome consequence.
- In the earlier definition, the clause permitting embedding of arguments required at least one premiss in addition to the embedded argument. The present definition removes this requirement.
- In the earlier definition, the clause permitting embedding of arguments imposed no restrictions on the embedded argument. The present definition requires the embedded argument to have a suppositional premiss.
- The earlier definition treated an embedded argument as a premiss. The present definition does not. It does however count an embedded piece of suppositional reasoning as adduced in support of a first-order illocutionary act. It is perhaps

[9]At least, that was the intention. The first base clause of the earlier definition declared that a triple consisting of a set of assertives, a conclusion indicator and an illocutionary act of any type was an argument, as was a triple consisting of an illocutionary act, a premiss indicator, and a set of assertives. But, as Goddu (2010) pointed out through a series of counterexamples, a triple is not a string of symbols. The earlier base clause implied that a sequence of three utterances by different people at widely separated times would count as an argument, which it obviously is not.

only a concession to traditional usage of the word 'premiss' to refrain from calling a piece of embedded suppositional reasoning a premiss.

- The earlier definition implied that an argument was something actually produced. The present definition treats an argument as a second-order illocutionary act that may or may not be actually performed, thus leaving for subsequent investigation the criteria, standards and procedures for determining when an argument has been produced.

The preceding comparison brings out most of the salient features of the present definition of an argument. Two more features are noteworthy. First, in contrast to the common tendency to classify an argument either as a kind of set or as a kind of discourse, the present definition classifies it as a kind of second-order illocutionary act. However, if an argument is actualized in communication to others, it is a kind of discourse. Second, as previously mentioned, the target of the act of adducing may be an inference claim.

The definition leaves undefined the central concept of adducing. Given the centrality of this concept, it seems reasonable to propose a set of "felicity conditions" for the successful performance of such an act. In his theory of illocutionary acts, Searle (1969) laid down for each species of illocutionary act four types of conditions for its successful and non-defective performance: propositional content conditions, preparatory conditions, sincerity conditions, and essential content conditions. Since adducing is a second-order illocutionary act, Searle's approach needs to be adapted. The content of an act of adducing is not a single proposition but a complex of first-order illocutionary acts. In the case of simple arguments, this complex consists of a pair: a set of one or more assertives or suppositives and a first-order illocutionary act of any type. Let us call these two contents the *reasons* and the *target*. Not all these ingredients need be due to the agent that adduces, but the agent doing the adducing must perform at least one of them. The essence of adducing is that the utterance[10] of the adducer counts either as a claim that the reasons if true or otherwise acceptable would provide epistemic support for the target or as a claim that the reasons if true or otherwise acceptable would provide epistemic opposition to the target. Since the context of adducing and the intentions of the adducer in adducing reasons for a target vary widely, there are few preparatory conditions common to all adducing. Perhaps one preparatory condition is that the addressee (who in the case of solo reasoning will be identical with the adducer) does not previously recognize that the reasons provide the claimed epistemic support for or opposition to the target. If one divided adducing into species according to the point of the adducing, one could add more preparatory conditions for each species. The sincerity condition for adducing is that the adducer believes that the reasons if true or otherwise acceptable would provide the claimed epistemic support for or opposition to the target.

[10]The word 'utterance' covers not just spoken sounds but also written marks, typed symbols, images, gestures, thoughts, and so forth—any occurrence that expresses one or more propositions.

As for complex arguments, a chaining of two arguments is a complex illocutionary act of adducing the resulting chain of reasoning as support for or attack on the ultimate target of the superordinate argument in the chain (i.e. the argument that has a reason which the other argument targets). The essence of adducing in this case is that the utterance of the adducer counts as a claim that in each link of the chain the reasons if true or otherwise acceptable would provide epistemic support for the target or as a claim that the reasons if true or otherwise acceptable would provide epistemic opposition to the target. An embedding of an argument is a complex act of adducing the embedded suppositional reasoning, possibly along with one or more additional reasons, as support for or opposition to the target of the argument in which the suppositional reasoning is embedded. The essence of adducing in this case is that the utterance of the adducer counts as a claim that the suppositional reasoning would if the additional reasons (if any) were true or otherwise acceptable provide epistemic support for the target or as a claim that the suppositional reasoning would if the additional reasons (if any) were true or otherwise acceptable provide epistemic opposition to the target. The content conditions, preparatory conditions and sincerity conditions for these more complex acts of adducing are a function of the content, preparatory and sincerity conditions for the simple acts of adducing from which they are constituted.

Further understanding of the import of the present definition of argument can come from comparing it to other proposed definitions. The chapter pointed out differences between its definition of argument and conceptions of argument proposed by Hamblin (1970), Walton (1990), Pinto (2001), Johnson (2000, 2002) and Blair (2004). For the most part, there are the same differences between the present definition and those conceptions. In particular, none of them provide for complex arguments created by chaining or embedding. And four of them take arguments to have just one purpose: either securing acceptance of a conclusion by one's addressee(s) (Hamblin, Pinto, Johnson) or dealing with a conflict that has arisen (Walton). In contrast, neither the present definition nor the earlier definition defined arguments as having a single purpose.

One difference between the earlier definition and its rivals no longer obtains with the present definition. Johnson(2000) includes as part of an argument what he calls its "dialectical tier": the penumbra around an argument's "illative core" in which the author responds to possible or actual criticisms and objections and considers alternative positions on the question at issue and the reasons that may be or are given for them. A response to an objection or criticism consists of one or more reasons against the objection or criticism, which count as arguments on the present definition of an argument. Similarly, reasons against an alternative position or against some argument for it also count as arguments on the present definition of an argument. Thus, the present definition of an argument counts Johnson's dialectical tier as consisting of arguments, whereas the earlier definition did not. The graphical representation of an argument as Johnson conceives it, with a dialectical tier included, would be what is called an "argument network" in the Argument Interchange Format (Rahwan and Reed 2009, p. 385), since the objections,

criticisms, alternative positions and reasons for alternative positions are due to real or imagined opponents rather than to the author.

The present definition of an argument as a second-order illocutionary act of adducing with an unspecified purpose differs from characterizations of argumentation as a second-order illocutionary act with a specified purpose: whether to justify or refute a standpoint (van Eemeren and Grootendorst 1984, 1992, 2004) or to justify a target claim (Bermejo-Luque 2011). While it may be legitimate to focus on this species of adducing reasons for or against something, the concept of argument should allow for other species of adducing that actually occur, such as working through a problem in one's head, pointing out to an interlocutor some consequence of that person's position, explaining why one holds a certain position, and so on.

Since the chapter was written, researchers in the field of artificial intelligence have been developing an "Argument Interchange Format" (AIF) as an infrastructure for a projected World Wide Argument Web (Rahwan et al. 2007, 2011; Rahwan and Reed 2009). The basic AIF (Rahwan and Reed 2009, pp. 385–386) defines an argument network as a directed graph consisting of nodes and edges. Nodes are of two types. Information nodes represent propositional information used in arguments. Scheme nodes represent application of schemes of three disjoint types: rules of inference, preferences, and conflicts. In an argument network, no edge joins two information nodes; that is, any edge that comes from an information node goes to a scheme node and any arrow that goes to an information node comes from a scheme node. A simple argument in an argument network with a specified set of schemes is a triple consisting of a set of nodes denoting premisses, a node denoting application of a rule of inference, and a node denoting a conclusion; there is an edge from each premiss to the scheme node and an edge from the scheme node to the conclusion node. For example, a *modus ponendo ponens* argument from propositions p and *if* p *then* q to a proposition q would consist of two nodes denoting each of the two premisses, a scheme node denoting application of the *modus ponendo ponens* rule of inference, and a node denoting the conclusion, with an edge from each of the two nodes to the scheme node and from the scheme node to the conclusion node. If another argument in the network has the negation of this argument's conclusion as a premiss, then one can represent the conflict by joining the two information nodes indirectly through a conflict node, with arrows going in each direction. If a component of one argument counts against a component of another argument but not vice versa, then one can represent the conflict by joining the two information nodes indirectly through a conflict node, in this case with one or more arrows going in one direction only from the conflict node. These three possibilities are represented in Fig. 32.1, taken from (Rahwan et al. 2011, p. 493). An extension of the AIF (Rahwan and Reed 2009, p. 388) provides for presumptive argument schemes, with their associated presumptions and exceptions. A second version of AIF that permits representation of dialogue was under development at the time of writing the present essay (Chris Reed, personal communication, November 2016).

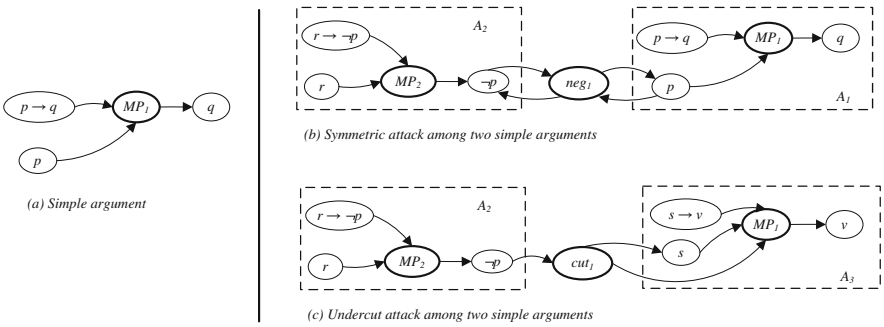

Fig. 32.1 Three types of argument networks in the Argument Interchange Format (reproduced from Rahwan et al. 2011, p. 493)

The Argument Interchange Format goes beyond the present definition of an argument in providing for the representation of multiple arguments advanced by different authors. It accommodates the act of adducing in the insertion of a scheme node between the premisses and conclusion of a simple argument, as well as between an attacker and a target and between two information nodes between which a preference is expressed. The present definition of argument makes no room for expressions of preference, but does allow for both inferences and attacks. It differs from the AIF in treating the information components of arguments as first-order illocutionary acts rather than as propositions; it appears that the AIF takes each proposition represented by an information node to be asserted by its author, which is a significant limitation of the AIF. It is however possible in the AIF to qualify commitment to a proposition by associating with the information node that represents it a probability of its being true. The AIF goes beyond the present definition of argument in requiring specification of the rule of inference or conflict scheme used in each simple argument or simple conflict in a network. This requirement seems to be a serious limitation, in that it will make automated representation of arguments found by argument mining very difficult, if not impossible. Further, the existing stock of recognized argument schemes (Walton et al. 2008), large as it is, is difficult to apply to the arguments that people actually use, which often do not fit into the stereotypical patterns provided by the schemes (Anthony and Kim 2015). On the other hand, the specification of the inference or conflict scheme applied permits evaluation of the support or attack to see if its components actually fit the scheme allegedly applied. Further, in the case of presumptive argument schemes, the AIF permits automated generation of presumptions to which the user of an inference scheme is committed and of possible exceptions that a rational critic can cite. The evaluation thus permitted depends on the soundness of the scheme used. In general, however, there is as yet no proof of the soundness of these schemes. Hahn and Hornikx have proposed a Bayesian foundation for them (Hahn and Hornikx 2016).

The chapter pointed out forms of communication that its definition excluded from the class of arguments: persuasion through the author's presentation of their own character or appeal to the addressees' emotions, insinuation, and much

non-verbal communication. The present definition excludes the same forms of communication, for the same reason, that they lack an explicit premiss-conclusion structure.

The following summary should replace the "second summary" in the chapter (Hitchcock 2007, p. 121; p. 469 of the present volume). A simple argument is a structure in which a set of one or more assertives or suppositives (the reasons) is adduced as support for or opposition to any illocutionary act (the target). Complex arguments are formed by chaining two arguments together or embedding a suppositional argument in a larger structure. The essence of a second-order illocutionary act of adducing in a simple argument is that it counts as a claim that the reasons cited would if true or otherwise acceptable support (attack) the target. This definition can be extended to complex arguments. Agents who express arguments can use them for a variety of purposes.

32.3 "Critical Thinking as an Educational Ideal" (2012)

"Critical thinking as an educational ideal" was written in 2011 for presentation at a conference in Wuhan, China and subsequently published in Chinese translation as (Hitchcock 2012). As acknowledged at the beginning, it incorporates material from (Jenicek and Hitchcock 2005) on the history, definition, components and process of critical thinking—material written in 2003, primarily by me. The sections on critical thinking as an educational ideal and on guidelines for teaching a stand-alone course in critical thinking were written in 2011. The original English-language version of the article is published for the first time in the present collection.

Reviewing the chapter, I see no need to change anything, just a need to add a few points.

To the list of definitions of critical thinking, there should be added the definition by Bailin and Battersby (2010) of critical inquiry as "the process of carefully examining an issue in order to come to a reasoned judgment" (Bailin and Battersby 2010, p. 4). By an issue, they mean a question where there is a challenge, controversy, or range in points of view. Their definition coheres with the definitions cited in the chapter, as well as with the process of thinking critically proposed by Jenicek and myself, and has the additional merit of indicating the type of question to which a reasonable answer requires critical thinking. It also makes clear that critical thinking is fundamentally a constructive activity, and that the consideration of arguments and positions put forward by others is a component of a broader, more constructive process.

In their conceptualization of the process of critical inquiry, Bailin and Battersby add a useful component to the final step of arriving at a judgment on the issue at hand, a component that they call "apportioning judgment" (Bailin and Battersby 2010, p. 180). This component involves assigning a qualitative level of confidence to one's judgment, for which they propose such terms as 'very confident', 'reasonably confident', and 'on balance'. Common law jurisdictions in the United

States have analogous levels of requirements for proof, depending on the type of case: beyond a reasonable doubt, clear and convincing evidence, preponderance of the evidence (Clermont 1987, pp. 1119–1120). It is clearly an important topic of scholarly investigation to work out an appropriate hierarchy of levels of confidence in one's judgments and guidelines for assigning a particular level in the hierarchy. A fine example of such a hierarchy and associated guidelines is the guidance note on consistent treatment of uncertainties prepared for lead authors of the *Fifth assessment report* of the International Panel on Climate Change (Mastrandrea et al. 2010). The note advises authors to "communicate uncertainty carefully, using calibrated language for key findings, and provide traceable accounts describing your evaluations of evidence and agreement" (p. 4). Authors are to describe their level of confidence in their findings as "very low," "low," "medium," "high," and "very high" on the basis of (a) the type, amount, quality and consistency of the evidence (rated in terms of these factors as "limited", "medium" or "robust") and (b) the degree of agreement ("low", "medium" or "high"). Where a level of uncertainty can be quantified, authors are to use qualitative terms corresponding to fuzzily defined probability ranges: "virtually certain" for 99–100% probability, "very likely" for 90–100% probability, "likely" for 66–100% probability, "about as likely as not" for 33–66% probability, "unlikely" for 0–33% probability, "very unlikely" for 0–10% probability, and "exceptionally unlikely" for 0–1% probability. In one's own critical thinking, such explicit labeling may make it easier to follow injunctions to proportion one's degree of confidence in the truth of a proposition to the strength of one's evidence for it (Chignell 2016).

To the attitudes and dispositions of a critical thinker mentioned in the chapter (such as open-mindedness and fair-mindedness), there should be added willingness to inquire, which Hamby (2014, 2015) has trenchantly argued is the cardinal critical thinking virtue. Hamby takes from Bailin and Battersby (2010) their conception of critical thinking as critical inquiry, "carefully examining an issue in order to reach a reasoned judgment" (Bailin and Battersby 2010, p. 4, cited in Hamby 2015, p. 77). A skilled critical thinker, Hamby asserts, is thus "a craftsperson of reasoned judgment" (Hamby 2015, p. 77). As with any skill, he argues, successful application of the skill requires a passion for applying it. To be a critical thinker, one who carefully examines issues when it is appropriate to do so with a view to arriving at a reasoned judgment, one must love to engage in the process of inquiry. The willingness to inquire is a fundamental all-embracing virtue of a critical thinker, Hamby argues, because the lack of it will block the deployment of all the skills of critical thinking, including interpretation and evaluation of arguments, evaluation of the credibility of sources of information, and clarification of meaning. Other dispositions of a critical thinker, such as fairness and open-mindedness, are both derivative from the fundamental virtue of willingness to inquire and less comprehensive in the range of skills whose capable exercise they facilitate. Cultivation of a willingness to inquire should thus be a central goal of education in critical thinking.

In the advice on designing a stand-alone course in critical thinking, the chapter recommends that instructors encourage meta-cognition, awareness of and ultimately

reflection on the strategies one is using in one's thinking. To this advice, one should add advice to make students aware of common cognitive biases that can unconsciously skew their thinking. Among the most influential and therefore dangerous of these biases, discussed in the first section of the present chapter, are belief bias (the tendency to let prior beliefs colour one's thinking inappropriately) and confirmation bias (the tendency to pay attention only to evidence that confirms a hypothesis one has in mind). Students need to be aware too that experiments in cognitive psychology indicate that conscious awareness of these biases and conscious attempts to set them aside as one is thinking about an issue are largely ineffective (Kenyon and Beaulac 2014). It tends to be more effective to adjust the circumstances of one's decision-making so as to prevent or minimize the operation of the bias. The guide to IPCC lead authors, for example, warns against the tendency for a group to converge on an expressed view and become overconfident in it. To block this tendency, each member of an author team should write down his or her individual assessments of the level of uncertainty before entering into a group discussion, and the team should recognize when individuals are adjusting their views as a result of group interactions and allow adequate time for such changes in viewpoint to be reviewed.

The chapter distinguishes three ways of incorporating critical thinking instruction into a curriculum: a stand-alone course, infusion in subject-matter instruction, and a combination. Ennis (1989, pp. 4–5) usefully distinguishes four ways: general, infusion, immersion, and mixed. A *general* approach teaches critical thinking dispositions and abilities outside of presentation of the content of specific subject-matter, either as a separate course or as a separate unit in a subject-matter course. An *infusion* approach makes general critical thinking principles explicit in the context of subject-matter instruction in which students are encouraged to think critically in the subject. An *immersion* approach similarly encourages deep thinking in a subject but does not make general critical thinking principles explicit. A *mixed* approach combines the general approach with either the infusion or the immersion approach. Ennis's taxonomy is more fine-grained than the taxonomy in the chapter, and in a useful way. In particular, at least one meta-analysis using his taxonomy (Abrami 2008) found that an infusion approach was generally more effective than an immersion approach, with an average effect size of 0.54 in infusion interventions but only 0.09 in immersion interventions.

32.4 "The Effectiveness of Instruction in Critical Thinking" (2015)

"The effectiveness of instruction in critical thinking" combines material from a report (Hitchcock 2004) of a study done in 2001 on the effectiveness of computer-assisted instruction in critical thinking with a summary written in 2014 of meta-analyses by Abrami and his group (Abrami et al. 2008, 2015) of hundreds of studies of the effectiveness of critical thinking instruction of various types and at

various levels of education. As pointed out in the chapter, the variety of settings in the amalgamated studies makes it problematic to take the Abrami group's findings of the most effective means of instruction (mixed approach, dialogue, engagement, coaching) as a firm prediction about what will work best in post-secondary education, which is the primary focus of the chapter. In addition, as Nancy Cartwright (Cartwright 2012; Cartwright and Hardie 2012) and Kvernbekk (2015) have pointed out, even the most well-designed and well-conducted study of the effectiveness of some intervention does not show that this intervention produced the observed effect all by itself. Typically, the intervention operates in the circumstances of the study as an insufficient but necessary component of an unnecessary but sufficient cause of change in the value of the variable of interest. Following Mackie (1965), such conditions are referred to as INUS conditions. To determine whether an INUS condition that worked in one setting will work in another, one needs to work out what other components operated with the INUS condition to have the effect and whether those other components exist or can be created in the new setting (Hitchcock 2016). In educational settings, instructors may need to adapt so-called "evidence-based" recommendations to fit the characteristics of their students and the constraints of their institution. In particular, it helps to have an understanding of the underlying theory that best explains the proven effectiveness in some settings of a given intervention. A circle-arrow causal diagram of the sort recommended by Pearl (2009) can be particularly helpful.

John Hattie (Hattie 2009) has proposed a theory of what type of learning and what type of teaching contribute the most to student achievement. Although he bases his theory on more than 800 meta-analyses of studies of factors affecting student achievement, it is not a pastiche of the factors found to have the largest effect sizes. Rather, it is a model of learning and teaching that in his view best explains why some types of intervention have been found to have large effects on student achievement and others small or even negative such effects. He calls his models "visible learning" and "visible teaching". As the names indicate, the crucial component is that learners *see* that they are learning and teachers *see* that they are teaching. Visible learning means having a clear sense of what you are trying to learn, frequent insight into how well you are doing at achieving that goal, and efforts to remedy deficiencies and correct mistakes as you identify them. Visible teaching means getting frequent information about how your teaching is coming across and making adjustments where the students are having difficulties learning. On both sides, the process is active, dynamic and goal-oriented. Hattie sums up his model as follows:

> … the simple adage underlying most of the syntheses in this book is "visible teaching and learning". Visible teaching and learning occurs [*sic*] when learning is the explicit goal, when it is appropriately challenging, when the teacher and the student both (in their various ways) seek to ascertain whether and to what degree the challenging goal is attained, when there is deliberate practice aimed at attaining mastery of the goal, when there is feedback given and sought, and when there are active, passionate, and engaging people (teacher, student, peers, and so on) participating in the act of learning. It is teachers seeing learning through the eyes of students, and students seeing teaching as the key to their ongoing learning (Hattie 2009, p. 22).

Although the subjects of the studies at the base of Hattie's synthesis seem to be school children, his model may apply to college and university education as well. If the causal nexus in visible learning and visible teaching operates in children aged 5–14, it is very likely to operate in the same children as they get older. At the very least, interventions implied by the visible learning model deserve empirical investigation in well-designed studies of post-secondary education. For post-secondary instruction in critical thinking, such interventions would include the following:

- clear specification of goals that are challenging but achievable
- frequent feedback to students on how well they are doing in achieving the specified goals
- frequent feedback to the teacher on how well the teaching is coming across and in particular on where students are having trouble understanding.

In addition, the following interventions could be helpful:

- peer-to-peer learning, i.e. students teaching each other
- student self-reports on how well they are achieving the goals
- mini-lessons in small groups followed by discussion of the lesson
- dialogue in small groups on critical thinking tasks directed at engaging material.

These implications of Hattie's model are consistent with, and reinforce, the finding of Abrami et al. (2015) that student discussion, engagement with a problem, and coaching are effective components of instruction in critical thinking.

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