Chapter One
Do we Need Philosophy?

Before we start, you may be tempted to ask, "Well, what of it?" Is it really necessary for us to bother about complicated questions of science and philosophy? To such a question, two replies are possible. If what is meant is: do we need to know about such things in order to go about our daily life, then the answer is evidently no. But if we wish to gain a rational understanding of the world in which we live, and the fundamental processes at work in nature, society and our own way of thinking, then matters appear in quite a different light.

Strangely enough, everyone has a "philosophy." For a philosophy is a way of looking at the world. We all believe we know how to distinguish right from wrong, good from bad. These are, however, very complicated issues which have occupied the attention of the greatest minds in history. When confronted with the terrible fact of the existence of events like the fratricidal war in the former Yugoslavia, the re-emergence of mass unemployment, the slaughter in Rwanda, many people will confess that they do not comprehend such things, and will frequently resort to vague references to "human nature." But what is this mysterious human nature which is seen as the source of all our ills, and is alleged to be eternally unchangeable? This is a profoundly philosophical question, to which not many would venture a reply, unless they were of a religious cast of mind, in which case they would say that God, in His wisdom, made us like that. Why anyone should worship a Being that played such tricks on His creations is another matter.

Those who stubbornly maintain that they have no philosophy are mistaken. Nature abhors a vacuum, it is said. Those who lack a coherently worked-out philosophical standpoint will inevitably reflect the ideas and prejudices of the society and the milieu in which they live. That means, in the given context, that their heads will be full of the ideas they imbibe from the newspapers, television, pulpit and schoolroom, which faithfully reflect the interests and morality of existing capitalist society.

Most people usually succeed in muddling through life, until some great upheaval compels them to re-consider the kind of ideas and values they grew up with. The crisis of society forces them to question many things they took for granted. At such times, ideas which seemed remote suddenly become strikingly relevant. Anyone who wishes to understand life, not as a meaningless series of accidents or an unthinking routine, must occupy themselves with philosophy, that is, with thought at a higher level than the immediate problems of everyday existence. Only by this means do we raise ourselves to a height where we begin to fulfil our potential as conscious human beings, willing and able to take control of our own destinies.

It is generally understood that anything worth while in life requires some effort. The study of philosophy, by its very nature, involves certain difficulties, because it deals with matters far removed from the world of ordinary experience. Even the terminology used presents difficulties because words are used in a way which does not necessarily correspond to the common usage. But the same is true for any specialised subject, from

engineering to psychology.

The second obstacle is more serious. In the last century, when Marx and Engels first published their writings on dialectical materialism, they could assume that many of their readers had at least a working knowledge of classical philosophy, including Hegel. Nowadays, it is not possible to make such an assumption. Philosophy no longer occupies the place it had before, since the role of speculation about the nature of the universe and life has long since been occupied by the sciences. The possession of powerful radio telescopes and spacecraft renders guesses about the nature and extent of our solar system unnecessary. Even the mysteries of the human soul are being gradually laid bare by the progress of neurobiology and psychology.

The situation is far less satisfactory in the realm of the social sciences, mainly because the desire for accurate knowledge often decreases to the degree that science impinges on the powerful material interests which govern the lives of people. The great advances made by Marx and Engels in the sphere of social and historical analysis and economics fall outside the scope of the present work. Suffice it to point out that, despite the sustained and frequently malicious attacks to which they were subjected from the beginning, the theories of Marxism in the social sphere have been the decisive factor in the development of modern social sciences. As for their vitality, this is testified to by the fact that the attacks not only continue, but tend to increase in intensity as time goes by.

In past ages, the development of science, which has always been closely linked to that of the productive forces, had not reached a sufficiently high level to permit men and women to understand the world in which they lived. In the absence of scientific knowledge, or the material means of obtaining it, they were compelled to rely upon the one instrument they possessed that could help them to make sense of the world, and thus gain power over it—the human mind. The struggle to understand the world was closely identified with humankind’s struggle to tear itself away from a merely animal level of existence, to gain mastery over the blind forces of nature, and to become free in the real, not legalistic, sense of the word. This struggle is a red thread running through the whole of human history.

Role of Religion

"Man is quite insane. He wouldn’t know how to create a maggot, and he creates Gods by the dozen." (Montaigne.)

"All mythology overcomes and dominates and shapes the force of nature in the imagination and by the imagination; it therefore vanishes with the advent of real mastery over them." (Marx, Grundrisse, p. 110.)

Animals have no religion, and in the past it was said that this constituted the main difference between humans and "brutes." But that is just another way of saying that only humans possess consciousness in the full sense of the word. In recent years, there has been a reaction against the idea of Man as a special and unique Creation. This is undoubtedly correct, in the sense that humans developed from animals, and, in many important respects, remain animals. Not only do we share many of the bodily functions

with other animals, but the genetic difference between humans and chimpanzees is less than two percent. That is a crushing answer to the nonsense of the Creationists.

Recent research with bonobo chimpanzees has proven beyond doubt that the primates closest to humans are capable of a level of mental activity similar, in some respects, to that of a human child. That is striking proof of the kinship between humans and the highest primates, but here the analogy begins to break down. Despite all the efforts of experimenters, captive bonobos have not been able to speak or fashion a stone tool remotely similar to the simplest implements created by early hominids. The two percent genetic difference between humans and chimpanzees marks the qualitative leap from the animal to the human. This was accomplished, not by a Creator, but by the development of the brain through manual labour.

The skill to make even the simplest stone tools involves a very high level of mental ability and abstract thought. The ability to select the right sort of stone and reject others; the choice of the correct angle to strike a blow, and the use of precisely the right amount of force—these are highly complicated intellectual actions. They imply a degree of planning and foresight not found in even the most advanced primates. However, the use and manufacture of stone tools was not the result of conscious planning, but was something forced upon man's remote ancestors by necessity. It was not consciousness that created humanity, but the necessary conditions of human existence which led to an enlarged brain, speech and culture, including religion.

The need to understand the world was closely linked to the need to survive. Those early hominids who discovered the use of stone scrapers in butchering dead animals with thick hides got a considerable advantage over those who were denied access to this rich supply of fats and proteins. Those who perfected their stone implements, and worked out where to find the best materials stood a better chance of survival than those who did not. With the development of technique came the development of the mind, and the need to explain the phenomena of nature which governed their lives. Over millions of years, through trial and error, our ancestors began to establish certain relations between things. They began to make abstractions, that is, to generalise from experience and practice.

For centuries, the central question of philosophy has been the relation of thinking to being. Most people live their lives quite happily without even considering this problem. They think and act, talk and work, with not the slightest difficulty. Moreover, it would not occur to them to regard as incompatible the two most basic human activities, which are, in practice, inseparably linked. Even the most elementary action, if we exclude simple biologically determined reactions, demands a degree of thought. To a degree, this is true not only of humans but also of animals, as a cat lying in wait for a mouse. In man, however, the kind of thought and planning has a qualitatively higher character than any of the mental activities of even the most advanced of the apes.

This fact is inseparably linked to the capacity for abstract thought, which enables humans to go far beyond the immediate situation given to us by our senses. We can envisage situations, not just in the past (animals also have memory, as a dog which cowers at the sight of a stick) but also the future. We can anticipate complex situations, plan, and thereby determine the outcome, and, to some extent, determine our own destinies.

Although we do not normally think about it, this represents a colossal conquest which sets humankind apart from the rest of nature. "What is distinctive of human reasoning," says Professor Gordon Childe, "is that it can go immensely farther from the actual present situation than any other animal's reasoning ever seems to get it." (What Happened in History, p. 19.) From this capacity springs all the manifold creations of civilisation, culture, art, music, literature, science, philosophy, religion. We also take for granted that all this does not drop from the skies, but is the product of millions of years of development.

The Greek philosopher Anaxagoras, in brilliant deduction, said that man's mental development depended upon the freeing of the hands. In his important article, The Part Played by Labour in the Transition from Ape to Man, Engels showed the exact way in which this transition was achieved. He proved that the upright stance, freeing of the hands for labour, the form of the hands, with the opposition of the thumb to the fingers, which allowed for clutching, were the physiological preconditions for toolmaking, which, in turn, was the main stimulus to the development of the brain. Speech itself, which is inseparable from thought, arose out of the demands of social production, the need to realise complicated functions by means of co-operation. These theories of Engels have been strikingly confirmed by the most recent discoveries of palaeontology, which show that hominid apes appeared in Africa far earlier than previously thought, and that they had brains no bigger than those of a modern chimpanzee. That is to say, the development of the brain came after the production of tools, and as a result of it. Thus, it is not true that "In the beginning was the Word," but as the German poet Goethe proclaimed—"In the beginning was the Deed."

The ability to engage in abstract thought is inseparable from language. The celebrated prehistorian Gordon Childe observes:

"Reasoning, and all that we call thinking, including the chimpanzee's, must involve mental operations with what psychologists call images. A visual image, a mental picture of, say, a banana, is always liable to be a picture of a particular banana in a particular setting. A word on the contrary is, as explained, more general and abstract, having eliminated just those accidental features that give individuality to any real banana. Mental images of words (pictures of the sound or of the muscular movements entailed in uttering it) form very convenient counters for thinking with. Thinking with their aid necessarily possesses just that quality of abstractness and generality that animal thinking seems to lack. Men can think, as well as talk, about the class of objects called 'bananas'; the chimpanzee never gets further than 'that banana in that tube.' In this way the social instrument termed language has contributed to what is grandiloquently described as 'man's emancipation from bondage to the concrete.'" (G. Childe, What Happened in History, pp. 19-20.)

Early humans, after a long period of time, formed the general idea of, say, a plant or an animal. This arose out of the concrete observation of many particular plants and animals. But when we arrive at the general concept "plant," we no longer see before us this or that flower or bush, but that which is common to all of them. We grasp the essence of a plant, its innermost being. Compared with this, the peculiar features of individual plants seem secondary and unstable. What is permanent and universal is contained in the general

conception. We can never actually see a plant as such, as opposed to particular flowers and bushes. It is an abstraction of the mind. Yet it is a deeper and truer expression of what is essential to the plant's nature, when stripped of all secondary features.

However, the abstractions of early humans were far from having a scientific character. They were tentative explorations, like the impressions of a child, guesses and hypotheses, sometimes incorrect, but always bold and imaginative. To early humans, the sun was a great being that sometimes warmed them, and sometimes burnt them. The earth was a sleeping giant. Fire was a fierce animal that bit them when they touched it.

Early humans experienced the phenomenon of thunder and lightning. This must have frightened them, as it still frightens animals and people today. But, unlike animals, humans looked for a general explanation of the phenomenon. Given the lack of any scientific knowledge, the explanation was invariably a supernatural one—some god, hitting an anvil with his hammer. To our eyes, such explanations seem merely amusing, like the na•ve explanations of children. Nevertheless, at this period they were extremely important hypotheses—an attempt to find a rational cause for the phenomenon, in which men distinguished between the immediate experience, and saw something entirely separate from it.

The most characteristic form of early religion is animism—the notion that everything, animate or inanimate has a spirit. We see the same kind of reaction in a child when it smacks a table against which it has banged its head. In the same way, early humans, and certain tribes today, will ask the spirit of a tree to forgive them before cutting it down. Animism belongs to a period when humankind has not yet fully separated itself from the animal world and nature in general. The closeness of humans to the world of animals is attested to by the freshness and beauty of cave-art, where horses, deer and bison are depicted with a naturalness which can no longer be captured by the modern artist. It is the childhood of the human race, which has gone beyond recall. We can only imagine the psychology of these distant ancestors of ours. But by combining the discoveries of archeology with anthropology, it is possible to reconstruct, at least in outline, the world from which we have emerged.

In his classic anthropological study of the origins of magic and religion, Sir James Frazer writes:

"A savage hardly conceives the distinction commonly drawn by more advanced peoples between the natural and the supernatural. To him the world is to a great extent worked by supernatural agents, that is, by personal beings acting on impulses and motives like his own, liable like him to be moved by appeals to their pity, their hope, and their fears. In a world so conceived he sees no limit to this power of influencing the course of nature to his own advantage. Prayers, promises, or threats may secure him fine weather and an abundant crop from the gods; and if a god should happen, as he sometimes believes, to become incarnate in his own person, then he need appeal to no higher being; he, the savage, possesses in himself all the powers necessary to further his own well-being and that of his fellow-men." (Sir James Frazer, The Golden Bough, p. 10.)

The notion that the soul exists separate and apart from the body comes down from the

most remote period of savagery. The basis of it is quite clear. When we are asleep, the soul appears to leave the body and roam about in dreams. By extension, the similarity between death and sleep ("death's second self," as Shakespeare expressed it) suggested the idea that the soul could continue to exist after death. Early humans thus concluded that there is something inside them that is separate from their bodies. This is the soul, which commands the body, and can do all kinds of incredible things, even when the body is asleep. They also noticed how words of wisdom issued from the mouths of old people, and concluded that, whereas the body perishes, the soul lives on. To people used to the idea of migration, death was seen as the migration of the soul, which needed food and implements for the journey.

At first these spirits had no fixed abode. They merely wandered about, usually making trouble, which obliged the living to go to extraordinary lengths to appease them. Here we have the origin of religious ceremonies. Eventually, the idea arose that the assistance of these spirits could be enlisted by means of prayer. At this stage, religion (magic), art and science were not differentiated. Lacking the means to gain real power over their environment, early humans attempted to obtain their ends by means of magical intercourse with nature, and thus subject it to their will.

The attitude of early humans to their spirit-gods and fetishes was quite practical. Prayers were intended to get results. A man would make an image with his own hands, and prostrate himself before it. But if the desired result was not forthcoming, he would curse it and beat it, in order to extract by violence what he failed to do by entreaty. In this strange world of dreams and ghosts, this world of religion, the primitive mind saw every happening as the work of unseen spirits. Every bush and stream was a living creature, friendly or hostile. Every chance event, every dream, pain or sensation, was caused by a spirit. Religious explanations filled the gap left by lack of knowledge of the laws of nature. Even death was not seen as a natural occurrence, but a result of some offence caused to the gods.

For the great majority of the existence of the human race, the minds of men and women have been full of this kind of thing. And not only in what people like to regard as primitive societies. The same kind of superstitious beliefs continue to exist, in slightly different guises, today. Beneath the thin veneer of civilisation, lurk primitive irrational tendencies and ideas which have their roots in a remote past which has been half-forgotten, but is not yet overcome. Nor will they be finally rooted out of human consciousness until men and women establish firm control over their conditions of existence.

Division of Labour

Frazer points out that the division between manual and mental labour in primitive society is invariably linked to the formation of a caste of priests, shamans or magicians:

"Social progress, as we know, consists mainly in a successive differentiation of functions, or, in simpler language, a division of labour. The work which in primitive society is done by all alike and by all equally ill, or nearly so, is gradually distributed among different classes of workers and executed more and more perfectly; and so far as the products,

material or immaterial, of his specialised labour are shared by all, the whole community benefits by the increasing specialisation. Now magicians or medicine-men appear to constitute the oldest artificial or professional class in the evolution of society. For sorcerers are found in every savage tribe known to us; and among the lowest savages, such as the Australian aborigines, they are the only professional class that exists." (Frazer, The Golden Bough, p. 104.)

The dualism which separates soul from body, mind from matter, thinking from doing, received a powerful impulse from the development of the division of labour at a given stage of social evolution. The separation between mental and manual labour is a phenomenon which coincides with the division of society into classes. It marked a great advance in human development. For the first time, a minority of society was freed from the necessity to work to obtain the essentials of existence. The possession of that most precious commodity, leisure, meant that men could devote their lives to the study of the stars. As the German materialist philosopher Ludwig Feuerbach explains, real theoretical science begins with cosmology:

"The animal is sensible only of the beam which immediately affects life; while man perceives the ray, to him physically indifferent, of the remotest star. Man alone has purely intellectual, disinterested joys and passions; the eye of man alone keeps theoretic festivals. The eye which looks into the starry heavens, which gazes at that light, alike useless and harmless, having nothing in common with the earth and its necessities—this eye sees in that light its own nature, its own origin. The eye is heavenly in its nature. Hence man elevates himself above the earth only with the eye; hence theory begins with the contemplation of the heavens. The first philosophers were astronomers." (Ludwig Feuerbach, The Essence of Christianity, p. 5.)

Although at this early stage this was still mixed up with religion, and the requirements and interests of a priest caste, it also signified the birth of human civilisation. This was already understood by Aristotle, who wrote:

"These theoretical arts, moreover, were evolved in places where men had plenty of free time: mathematics, for example, originated in Egypt, where a priestly caste enjoyed the necessary leisure." (Metaphysics, p. 53.)

Knowledge is a source of power. In any society in which art, science and government is the monopoly of a few, that minority will use and abuse its power in its own interests. The annual flooding of the Nile was a matter of life and death to the people of Egypt, whose crops depended on it. The ability of the priests in Egypt to predict, on the basis of astronomical observations, when the Nile would flood its banks must have greatly increased their prestige and power over society. The art of writing, a most powerful invention, was the jealously guarded secret of the priest-caste. As Prigogine and Stengers comment:

"Sumer discovered writing; the Sumerian priests speculated that the future might be written in some hidden way in the events taking place around us in the present. They even systematised this belief, mixing magical and rational elements." (Ilya Prigogine and Isabelle Stengers, Order Out of Chaos, p. 4.)

The further development of the division of labour gave rise to an unbridgeable gulf between the intellectual elite and the majority of humankind, condemned to labour with their hands. The intellectual, whether Babylonian priest or modern theoretical physicist, knows only one kind of labour, mental labour. Over the course of millennia, the superiority of the latter over "crude" manual labour becomes deeply ingrained and acquires the force of a prejudice. Language, words and thoughts become endowed with almost mystical powers. Culture becomes the monopoly of a privileged elite, which jealously guards its secrets, and uses and abuses its position in its own interests.

In ancient times, the intellectual aristocracy made no attempt to conceal its contempt for physical labour. The following extract from an Egyptian text known as The Satire on the Trades, written about 2000 B.C. is supposed to consist of a father's exhortation to his son, whom he is sending to the Writing School to train as a scribe:

"I have seen how the belaboured man is belaboured—thou shouldst set thy heart in pursuit of writing. And I have observed how one may be rescued from his duties [sic!]—behold, there is nothing which surpasses writing…
"I have seen the metalworker at his work at the mouth of his furnace. His fingers were somewhat like crocodiles; he stank more than fish-roe…
"The small building contractor carries mud…He is dirtier than vines or pigs from treading under his mud. His clothes are stiff with clay…
"The arrow-maker, he is very miserable as he goes out into the desert [to get flint points]. Greater is that which he gives to his donkey than its work thereafter [is worth]…
"The laundry man launders on the [river] bank, a neighbour of the crocodile…
"Behold, there is no profession free of a boss—except for the scribe: he is the boss…
"Behold, there is no scribe who lacks food from the property of the House of the King—life, prosperity, health!…His father and his mother praise god, he being set upon the way of the living. Behold these things—I [have set them] before thee and thy children's children." (Quoted in M. Donaldson, Children's Minds, p. 84.)

The same attitude was prevalent among the Greeks:

"What are called the mechanical arts," says Xenaphon, "carry a social stigma and are rightly dishonoured in our cities, for these arts damage the bodies of those who work in them or who act as overseers, by compelling them to a sedentary life and to an indoor life, and, in some cases, to spend the whole day by the fire. This physical degeneration results also in deterioration of the soul. Furthermore, the workers at these trades simply have not got the time to perform the offices of friendship or citizenship. Consequently they are looked upon as bad friends and bad patriots, and in some cities, especially the warlike ones, it is not legal for a citizen to ply a mechanical trade." (Oeconomicus, iv, 203, quoted in Farrington, op. cit., pp. 28-9.)

The radical divorce between mental and manual labour deepens the illusion that ideas, thoughts and words have an independent existence. This misconception lies at the heart of all religion and philosophical idealism.

It was not god who created man after his own image, but, on the contrary, men and womenwho created gods in their own image and likeness. Ludwig Feuerbach said that if

birds had a religion, their God would have wings. "Religion is a dream, in which our own conceptions and emotions appear to us as separate existences, beings out of ourselves. The religious mind does not distinguish between subjective and objective—it has no doubts; it has the faculty, not of discerning other things than itself, but of seeing its own conceptions out of itself as distinct beings." (Feuerbach, The Essence of Christianity, pp. 204-5.) This was already understood by men like Xenophanes of Colophon, who wrote "Homer and Hesiod have ascribed to the gods every deed that is shameful and dishonourable among men: stealing and adultery and deceiving each other…The Ethiopians make their gods black and snub-nosed, and the Thracians theirs grey-eyed and red-haired…If animals could paint and make things, like men, horses and oxen too would fashion the gods in their own image." (Quoted in A. R. Burn, Pelican History of Greece, p. 132.)

The Creation myths which exist in almost all religions invariably take their images from real life, for example, the image of the potter who gives form to formless clay. In the opinion of Gordon Childe, the story of the Creation in the first book of Genesis reflects the fact that, in Mesopotamia the land was indeed separated from the waters "in the Beginning," but not by divine intervention:

"The land on which the great cities of Babylonia were to rise had literally to be created; the prehistoric forerunner of the biblical Erech was built on a sort of platform of reeds, laid crisscross upon the alluvial mud. The Hebrew book of Genesis has familiarised us with much older traditions of the pristine condition of Sumer—a ‘chaos’ in which the boundaries between water and dry land were still fluid. An essential incident in ‘The Creation’ is the separation of these elements. Yet it was no god, but the proto-Sumerian themselves who created the land; they dug channels to water the fields and drain the marsh; they built dykes and mounded platforms to protect men and cattle from the waters and raise them above the flood; they made the first clearings in the reed brakes and explored the channels between them. The tenacity with which the memory of this struggle persisted in tradition is some measure of the exertion imposed upon the ancient Sumerians. Their reward was an assured supply of nourishing dates, a bounteous harvest from the fields they had drained, and permanent pastures for flocks and herds." (G. Childe, Man Makes Himself, pp. 107-8.)

Man’s earliest attempts to explain the world and his place in it were mixed up with mythology. The Babylonians believed that the god Marduk created Order out of Chaos, separating the land from the water, heaven from earth. The biblical Creation myth was taken from the Babylonians by the Jews, and later passed into the culture of Christianity. The true history of scientific thought commences when men and women learn to dispense with mythology, and attempt to obtain a rational understanding of nature, without the intervention of the gods. From that moment, the real struggle for the emancipation of humanity from material and spiritual bondage begins.

A Revolution in Thought

The advent of philosophy represents a genuine revolution in human thought. Like so much of modern civilisation, we owe it to the ancient Greeks. Although important advances were also made by the Indians and Chinese, and later the Arabs, it was the

Greeks who developed philosophy and science to its highest point prior to the Renaissance. The history of Greek thought in the four hunded year period, from the middle of the 7th century B.C., constitutes one of the most imposing pages in the annals of human history.

Here we have a long line of heroes who pioneered the development of thought. The Greeks discovered that the world was round, long before Columbus. They explained that humans had evolved from fishes long before Darwin. They made extraordinary discoveries in mathematics, especially geometry, which were not greatly improved upon for one and a half millennia. They invented mechanics and even invented the steam engine.

What was startlingly new about this way of looking at the world was that it was not religious. In complete contrast to the Egyptians and Babylonians, from whom they had learnt a lot, the Greek thinkers did not resort to gods and goddesses to explain natural phenomena. For the first time, men and women sought to explain the workings of nature purely in terms of nature. This was one of the greatest turning-points in the entire history of human thought. True science starts here.

The Birth of Philosophy

Western philosophy was born under the clear blue skies of the early Aegean. The 8th and 7th centuries B.C. was a period of rapid economic expansion in the eastern Mediterranean. These were stirring times. The Greeks of the Ionian islands, which now lie off the coast of Turkey, conducted a thriving trade with Egypt, Babylon and Lydia. The Lydian invention of money was introduced into Europe via Aegina at about 625 B.C., greatly stimulating trade, bringing in its wake great riches for some and indebtedness and slavery for others.

The earliest Greek philosophy represents the true starting point of philosophy. Itt is an attempt to struggle free from the age-old bounds of superstition and myth, to dispense with gods and goddesses, so that, for the first time, human beings could stand face to face with nature and with real men and women.

The economic revolution gave rise to new social contradictions. The breakdown of the old patriarchal society provoked a clash between rich and poor. The old aristocracy was faced with the discontent of the masses and the opposition of the "tyrants," frequently dissident nobles themselves, who were always willing to put themselves at the head of popular risings. A period of instability opened up, in which men and women began to question the old beliefs.

The situation in Athens at this time is described in the following passage:

"In the bad years they (the peasants) had to borrow from rich neighbours; but with the coming of money, this meant that, instead of borrowing a sack of corn in the good old neighbourly way, one had to borrow the price of enough corn to tide one over, before the harvest, when it was cheap; or alternatively, to pay heavy interest, of the kind that raised such indignation at Megara. By 600, while rich men exported to good markets in Aegina or Corinth, poor men were going hungry. Many, too, were losing their land, pledged as

security for debts, and even their liberty; for the debtor's last recourse against the insolvent debtor was to seize him and his family as slaves...The law was harsh; it was rich man's law." (A. R. Burn, The Pelican History of Greece, p. 119.)

These laws were put into a code by one Drakon, from which the phrase "Draconian laws" has become proverbial.

The turbulent 6th century B.C. was a period of decline of the Greek Ionian republics of Asia Minor, characterised by social crisis and ferocious class struggle between rich and poor, masters and slaves. "At Miletus, in Asia Minor," writes Rostovtsev, "the people were at first victorious and murdered the wives and children of the aristocrats; then the aristocrats prevailed and burned their opponents alive, lighting up the open spaces of the city with live torches." (Quoted in Bertrand Russell, History of Western Philosophy, p. 44.)

These conditions were typical of most other Greek cities of Asia Minor, at the time. The heroes of this age had nothing in common with the later idea of the philosopher, isolated from the rest of humanity in his ivory tower. These "wise men" were not only thinkers, but doers, not only theoreticians, but practical men of the world. Of the first of them, Thales of Miletus (c. 640-546 B.C.), we know next to nothing, but it is expressly stated that it was only late in life that he took to philosophy, and that he was also involved in commerce, engineering, geometry and astronomy (he is said to have predicted an eclipse, which must have been the one in 585 B.C.).

What is indisputable is that all the early Greek philosophers were materialists. Turning their backs on mythology, they sought to find a general principle for the workings of nature from an observation of nature itself. The later Greeks refer to them as hylozoists, which can be translated as "those who think that matter is alive." This conception of matter as self-moving is strikingly modern, and far superior to the mechanical physics of the 18th century. Given the absence of modern scientific instruments, their theories frequently had the character of inspired guesswork. But, taking into account the lack of resources, the amazing thing is how close they came to a real understanding of the workings of nature. Thus the philosopher Anaximander (c. 610-545 B.C.) worked out that man and all other animals had developed from a fish, which abandoned water for the land.

It is misleading to suppose that these philosophers were religious just because they used the word "god" (theos) in relation to primary substance. J. Burnet states that it meant no more than the old Homeric epithets like "ageless," "deathless," etc. Even in Homer, the word is used in several different senses. From Hesiod's Theogeny it is clear that many of the "gods" were never worshipped, but were merely convenient personifications of natural phenomena or even human passions. Primitive religions looked on the heavens as divine and set apart from the earth. The Ionian philosophers radically broke with this standpoint. While basing themselves on the many discoveries of Babylonian and Egyptian cosmology, they rejected the mythical element, which confused astronomy with astrology.

The general tendency of Greek philosophy before Socrates was to search for the

underlying principles of nature:

"Nature it was—that which is most immediately present to us, that which lies nearest the eye, that which is palpablest—that first attracted the spirit of inquiry. Under its changeful forms, its multiplex phenomena, there must lie, it was thought, a first and permanent fundamental principle. What is this principle? What precisely, what natural element is the basic element?" (Schwegler, History of Philosophy, p. 6.)

They gave different explanations for this. For example, Thales claimed that the basis of all things is water. This was a great advance for human thought. True, the Babylonians had long before put forward the idea that all things came from water. In their Creation myth, which was the model for the Hebrew story of the Creation in the first book of Genesis. "All lands were sea," says the legend, until Marduk, the Babylonian creator, separated the land from the sea. The difference here is that there is no Marduk, no divine creator standing outside nature. Instead, for the first time, nature is explained in purely materialist terms, that is, in terms of nature itself.

Nor is the idea of nature as reducible to water as far-fetched as it might appear. Apart from the fact that the great majority of the earth's surface is made up of water, something the Ionian Greeks above all were aware of, water is essential for all forms of life. The bulk of our body consists of water, and we would quickly die if deprived of it. Moreover, water changes its forms, passing from a liquid to a solid, to a vapour. On this Burnet comments:

"Nor is it hard to see how the meteorological considerations may have led Thales to adopt the views he did. Of all the things we know, water seems to take the most various shapes. It is familiar to us in a solid, a liquid, and a vaporous form, and so, Thales may well have thought he saw the world-process from water and back to water again going on before his eyes. The phenomenon of evaporation naturally suggests that the fire of the heavenly bodies is kept up by the moisture they draw from the sea. Even at the present day, people speak of the 'sun drawing up water.' Water comes down again in rain; and lastly, so the early cosmologists thought, it turns to earth. This may have seemed natural enough to men who were familiar with the rivers of Egypt which had formed the Delta, and the torrents of Asia Minor which bring down large alluvial deposits." (J. Burnet, Early Greek Philosophers, p. 49.)

Anaximander

Thales was followed by others philosophers who advanced different theories as to the basic structure of matter. Anaximander is said to have come from Samos, where the famous Pythagoras also lived. He is said to have written about nature, the fixed stars, the earth's sphere and other matters. He produced something like a map, showing the boundary of land and sea, and was responsible for a number of mathematical inventions, including a sun dial and an astronomical chart.

Like Thales, Anaximander considered what the nature of reality was. Like him, he approached this question from a strictly materialist point of view, without recourse to the gods or any supernatural elements. But, unlike his contemporary, Thales, he did not seek

to find the answer in a particular form of matter, such as water. According to Diogenes, "He adduced the Infinite (the indetermined) as the principle and element; he neither determined it as water, air or any such thing." (Quoted in Hegel's History of Philosophy, Vol. one, p. 185.) And again, "It is the principle of all becoming and passing away; at long intervals infinite worlds or gods rise out of it, and again they pass away into the same." (Ibid.)

This put the study of the universe on a scientific footing for the first time, and enabled the early Greek philosophers to make outstanding discoveries, far in advance of their time. They first discovered that the world is round and does not rest on anything, that the earth was not the centre of the universe, but revolves with the other planets round the centre. According to another contemporary, Hippolitos, Anaximander said that the earth swings free, held in place by nothing, because it is equidistant from everything, and is round in shape and hollow, like a pillar, so that we are on one side of the earth, and others on the other. They also discovered the true theory of lunar and solar eclipses.

With all their gaps and deficiencies, these ideas represent a startlingly bold and original conception of nature and the universe, certainly far nearer to the truth than the blinkered mysticism of the Middle Ages, when human thought was again shackled by religious dogma. Moreover, these important advances were not merely the result of guesswork, but the result of careful thought, investigation and experiment. 2,000 years before Darwin, Anaximander anticipated the theory of evolution, with his amazing discoveries in marine biology. The historian A. R. Burn believes that this was no accident, but the result of scientific investigation: "It looks as though he had made observations on embryos and also on fossils, as one of his successors certainly did; but we are not positively told." (A. R. Burn, The Pelican History of Greece, p. 130.)

Anaximander effected a great revolution in human thought. Instead of limiting himself to this or that concrete form of matter, he arrived at the concept of matter in general, matter as a philosophical concept. This universal substance is eternal and infinite, constantly changing and evolving. All the myriad forms of being we perceive through our senses are different expressions of the same basic substance. This idea was so novel that for many it proved incomprehensible. Plutarch complained that Anaximander did not specify which one of the elements his Infinite was—water, earth, air or fire. But precisely in this lay the epoch-making character of the theory.

Anaximenes

The last of the great trio of Ionian materialists was Anaximenes (c. 585-528 B.C.). He is said to have been born when Thales "flourished," and to have "flourished" when Thales died. He was younger than Anaximander. Unlike Anaximander, and following Thales, he took a single element—"air"—as the absolute substance, from which everything comes forth and to which everything is ultimately reduced. In fact, Anaximenes' use of the word "air" (aer) differs substantially from the modern usage. It includes vapour, mist and even darkness. Many translators prefer the word "mist."

At first sight, this idea represents a step back in comparison to the position of matter in general arrived at by Anaximander. In fact, his world-view was a step forward.

Anaximenes attempted to show how "air," the universal substance, becomes transformed through a process of what he called rarification and condensation. When it is rarefied, it becomes fire, when condensed, wind. By further condensation, we get clouds, water, earth and stones. But although in details his view of the universe compares unfavourably with that of Anaximander (he thought the world was shaped like a table, for instance), nevertheless, his philosophy represented an advance, inasmuch as he tried to move beyond a general statement of the nature of matter. He attempted to give it a more precise determination, not only qualitatively, but quantitatively, through the process of rarification and condensation. In the words of professor Farrington:

"Observe, in following this succession of thinkers, how their logic, their stock of ideas, their power of abstraction, increase as they grapple with their problem. It was a great advance in human thinking when Thales reduced the manifold appearances of things to one First Principle. Another great step was taken when Anaximander chose, as his First Principle, not a visible form of things like water, but a concept like the Indeterminate. But Anaximenes was still not content. When Anaximander sought to explain how the different things emerged from the Indeterminate, he gave a reply that was a mere metaphor. He said it was a process of ‘separating out.’ Anaximenes felt that something more was needed, and came forward with the complementary ideas of Rarification and Condensation, which offered an explanation of how quantitative changes could produce qualitative ones." (B. Farrington, op. cit., p. 39.)

Given the existing level of technique, it was impossible for Anaximenes to arrive at a more precise characterisation of the phenomena under consideration. It is easy to point to the deficiencies and even absurdities of his views. But this would miss the point. The early Greek philosophers cannot be blamed for failing to provide their world picture with a detailed content, which was only possible on the basis of over 2,000 years of subsequent economic, technological and scientific advance. These great pioneers of human thought rendered humanity the unique service of breaking away from the age-old habits of religious superstition, and thereby laid the foundation without which all scientific and cultural advance would have been unthinkable.

Moreover, the general view of the universe and nature elaborated by these great revolutionary thinkers was in many respects close to the truth. Their problem was that, given the level of development of production and technology, they did not have the means of testing their hypotheses, and putting them on a solid footing. They anticipated many things which could only be fully worked out by modern science, resting on a far higher development of science and technique. Thus, for Anaximenes, "air" is only shorthand for matter in its simplest, most basic form. As Erwin Schrödinger, one of the founders of modern physics shrewdly remarked: "Had he said dissociated hydrogen gas," (which he could hardly be expected to say), "he would not be so far from our present view." (Quoted in A. R. Burn, op. cit., p. 131.)

The earlier Ionian philosophers of nature had probably gone as far as they could to explain the workings of nature by means of speculative reason. These were truly great generalisations, which pointed in the right direction. But, in order to carry the process further, it was necessary to examine things in greater detail, to proceed to analyse nature piece by piece. This was later begun by Aristotle and the Alexandrine Greek thinkers. But

an important part of this task was to consider nature from a quantitative point of view. Here the Pythagorean philosophers undoubtedly played a major role.

Already Anaximenes had pointed in this direction, in attempting to pose the question of the relation between changes of quantity and quality in nature (rarification and condensation). But this method had by now reached its limits and exhausted itself. As J. D. Bernal puts it: "The triumph of the Ionian school was that it had set up a picture of how the universe had come into being and how it worked without the intervention of gods or design. Its basic weakness was its vagueness and qualitative character. By itself it could lead nowhere; nothing could be done with it. What was needed was the introduction of number and quantity into philosophy." (J. D. Bernal, Science in History, p. 122.)

From Materialism to Idealism

The period of the ascent of ancient Greek philosophy was characterised by a profound crisis of society, marked by a general questioning of the old beliefs, including the established religion. The crisis of religious belief gave rise to atheist tendencies, and the birth of a genuinely scientific outlook, based on materialism. However, as always in society, the process took place in a contradictory way. Alongside the rationalist and scientific tendencies, we also see the opposite—a growing trend towards mysticism and irrationality. A very similar phenomenon occurred at the time of the crisis of Roman society, in the last period of the republic, with the rapid spread of oriental religions, of which Christianity was originally only one among many.

To the mass of peasants and slaves, living in a time of social crisis, the gods of Olympus seemed remote. This was a religion for the upper classes. There was no prospect of a future reward for present suffering in the after-life. The Greek underworld was a cheerless place inhabited by lost souls. The newer cults, with their mimetic dancing and choral singing (the real origin of Greek tragedy), their mysteries (from the verb "myo," meaning to keep your mouth shut), and the promise of life after death, was far more attractive to the masses. Particularly popular was the cult of Dionysius, the god of wine (known to the Romans as Bacchus), which involved drunken orgies. This was much more appealing than the old gods of Olympia.

As in the period of decline of the Roman empire, and in the present period of capitalist decline, there was a spread of all kinds of mystery cults, mixed with new exotic rites imported from Thrace and Asia Minor and possibly Egypt. Of particular importance was the cult of Orpheus, a refinement of the cult of Dionysius, with many points in common with the Pythagorean movement. Like the Pythagoreans, the followers of the cult of Orpheus believed in the transmigration of souls. They had rites of purification, including abstaining from meat, except for sacramental purposes. Their view of man was based on dualism—the idea of the cleavage of body and soul. For them, man was partly of heaven, partly of earth.

So close are these ideas to the Pythagorean doctrines that some authors, such as Bury, maintain that the Pythagoreans were really a branch of the Orphean movement. This is an exaggeration. Despite its mystical elements, the Pythagorean school made an important

contribution to the development of human thought, especially mathematics. It cannot be dismissed as a religious sect. Nevertheless, it is impossible to resist the conclusion that the idealist conceptions of Pythagoreanism are not just an echo of a religious world outlook, but stem directly from it. Bertrand Russell traces the development of idealism back to the mysticism of the Orphean religion:

"This mystical element entered into Greek philosophy with Pythagoras, who was a reformer of orpheanism as Orpheus was a reformer of the religion of Dionysius. From Pythagoras Orphic elements entered into the philosophy of Plato, and from Plato into most later philosophy that was in any degree religious." (Russell, op. cit., p. 39.)

The division between mental and manual labour reaches an extreme expression with the growth of slavery. This phenomenon was directly related to the spread of Orphism. Slavery is an extreme form of alienation. Under capitalism, the "free" worker alienates himself from his labour-power, which presents itself to him as a separate and hostile force—capital. Under slavery, however, the slave loses his very existence as a human being. He is nothing. Not a person, but a "tool with a voice." The product of his labour, his body, his mind, his soul are the property of another, who disposes of them without regard to his wishes. The unfulfilled desires of the slave, his extreme alienation from the world and himself, gives rise to a feeling of rejection towards the world and all its works. The material world is evil. Life is a vale of tears. Happiness is not to be found there, only in death, which gives release from toil. The soul, freed from its prison in the body, can become free.

In all periods of social decline, men and women have two options: either to confront reality, and fight to change it, or to accept that there is no way out, and resign themselves to their fate. These two contrasting outlooks are inevitably reflected in two antagonistic philosophies—materialism and idealism. If we desire to change the world, it is necessary to understand it. We must look reality in the face. The cheerful optimism of the early Greek materialists was typical of this outlook. They wanted to know. Later, all that changed. The break-up of the old order, the rise of slavery and a general sense of insecurity led to a certain introversion and pessimism. In the absence of a clear alternative, the tendency to look away from reality, to seek individual salvation in mysticism, gradually gained ground. The lower orders looked to mystery cults, like those of Demeter, giver of corn, Dionysius, giver of wine, and later the cult of Orpheus. But the upper classes were not immune to the problems of the period. These were troubled times. Prosperous cities could be turned to ashes overnight, and their citizens killed or sold into slavery.

The city of Sybaris, Croton’s powerful commercial rival, was renowned for its wealth and luxury. So wealthy were the upper class that all kind of tall stories were told about the "sybarite" life style. A typical example was the young Sybarite who, upon rising, complained of a crumpled rose-leaf in his bed. It is said that they piped their wine to the quay. Allowing for an element of exaggeration, it is clear that this was a most prosperous city, where the rich lived a life of great luxury. However, the growth of inequality gave rise to a ferocious class struggle.

This was a period in which the division of labour was enormously intensified,

accompanied by the rapid growth of slavery, and an ever-increasing gulf between rich and poor. The industrial and residential quarters were completely segregated. But high walls and guards did not save the rich citizens of Sybaris. As in other city states, a revolution erupted, in which the "tyrant," Telys, seized power with the support of the masses. This gave Croton the excuse to declare war on its rival, at a moment when it was weakened by internal divisions. After a seventy day campaign, the city fell into their hands. A. R. Burn comments: "They utterly destroyed it, turning the local river across its site, while survivors scattered, largely to the west coast. The particular savagery of this war is more easily understood when it is seen as a class war." (A. R. Burn, op. cit., p. 140.)

It is in this specific context that we must see the rise of the Pythagorean school of philosophy. As in the period of decline of the Roman Empire, a section of the ruling class was filled with a feeling of anxiety, fear and perplexity. The old gods offered no solace or hope of delivery, either to rich or poor. Even the good things in life lost some of their appeal to men and women who felt they were sitting on the edge of an abyss. Under such conditions of general insecurity, when even the strongest and most prosperous states could be overthrown in a short time, the doctrines of Pythagoras struck a chord with a section of the ruling class, despite their ascetic character, or even because of it. The esoteric and intellectual nature of this movement gave it no appeal to the masses, where the Orphic cult had gained a huge following.

Pythagoras and His School

It is safer to speak of the school rather than of its founder, since it is difficult to disentangle the philosophy of Pythagoras from the myths and obscurantism of his followers. No written fragments of his have survived, and it is doubtful if they ever existed. Even the existence of Pythagoras has been questioned. However, the influence of his school on Greek thought was profound.

Pythagoras is said to have been a native of the island of Samos, a thriving commercial power, like Miletus. Its local dictator ("tyrant"), Polycrates, had overthrown the landed aristocracy and was ruling with the support of the merchant class. Of him, the historian Herodotos reports that he robbed all men indiscriminately, for he said that his friends were more grateful if he gave them their property back than they would have been if he had never taken it! In his youth, Pythagoras apparently worked as a "philo-sophos" (lover of wisdom) under the patronage of Polycrates. He travelled to Phoenicia and Egypt, where he is said to have been initiated into an Egyptian priest caste. In 530 B.C., he fled to Croton in southern Italy to escape from civil strife and the threat posed by the Persians to Ionia.

The luxuriant overgrowth of myth and fable makes it almost impossible to say anything certain about the man. His school certainly was a remarkable mixture of mathematical and scientific investigation and a religious-monastic sect. The community was run on monastic lines, with strict rules which included, for instance: not to eat beans; not to pick up what was fallen; not to stir the fire with iron; not to step over a crowbar, etc. The whole idea was to escape from the world, to seek salvation in a life of peaceful contemplation based on mathematics, which was invested with supposedly mystical

qualities. Probably reflecting oriental influences, the Pythagoreans also preached the transmigration of souls.

In contrast to the cheerful worldliness of the Ionian materialists, here we have all the elements of the later idealist world outlook later developed by Plato, and taken over by Christianity, which bedevilled the growth of the spirit of scientific inquiry for many centuries. The moving spirit behind this ideology is aptly expressed by J. Burnet in the following lines:

"We are strangers in this world, and the body is the tomb of the soul, and yet we must not seek to escape by self-murder: for we are the chattels of God who is our herdsman, and without His command we have no right to make our escape. In this life, there are three kinds of men, just as there are three sorts of people who come to the Olympic Games. The lowest class is made up of those who come to buy and sell, the next above them are those who come to compete. Best of all, however, are those who simply come to look on. The greatest purification of all is, therefore, disinterested science, and it is the man who devotes himself to that, the true philosopher, who has most effectively released himself from the 'wheel of birth.'" (Quoted in Russell, op. cit., p. 52.)

This philosophy, with its strong elitist and monastic overtones, proved popular with the wealthy classes of Croton, although how many really gave up eating beans, or anything else, may be open to doubt! The common thread in all this is the radical separation of the soul from the body. This idea, with its roots in a prehistoric conception of man's place in nature, has been passed down in different forms throughout history. It even resurfaces in one of the Hippocratic treatises:

"When the body is awake, the soul is not her own mistress but serves the body, her attention divided between the various bodily senses—sight, hearing, touch, waking and all bodily actions—which deprive the mind of its independence. But, when the body is at rest, the soul wakes and stirs and keeps her own house, and carries out herself all the activities of the body. In sleep the body does not feel, but the soul awake knows everything; she sees what is to be seen, hears what has to be heard, walks, touches, grieves, remembers—in a word, all the functions of body and soul alike are performed in sleep by the soul. And therefore anyone who knows how to interpret these matters possesses a great part of wisdom."

In contrast to the Ionian materialist philosophers, who deliberately turned their backs on religion and mythology, the Pythagoreans took over the idea of the Orphic mystery cult that the soul could free itself from the body by means of an "ecstasy" (the word ekstasis means "stepping out"). Only when the soul left the prison of the body was it deemed to express its true nature. Death was life and life was death. Thus, from its inception, philosophical idealism, in common with its Siamese twin, religion, represented an inversion of the real relation between thought and being, man and nature, people and things, which has persisted down to the present time, in one form or another, with the most pernicious results.

The Pythagorean Doctrine

In spite of its mystical character, the Pythagorean doctrine marked a step forward in the development of philosophy. There is nothing strange about this. In the evolution of human thought, there are many instances in which the pursuit of irrational and unscientific goals nevertheless have furthered the cause of science. For centuries, the alchemists exerted themselves fruitlessly in an attempt to discover the "philosopher's stone." This ended in failure. But in the process, they made extremely important discoveries in the field of experiment which provided the basis upon which modern science, especially chemistry, later developed.

The basic tendency of Ionian philosophy was an attempt to generalise from the experience of the real world. Pythagoras and his followers attempted to arrive at an understanding of the nature of things by a different route. Schwegler puts it thus:

"We have the same abstraction, but on a higher stage, when the sensuous concretion of matter in general is looked away from; when attention is turned no longer to the qualitative aspect of matter, as water, air, etc., but to its quantitative measure and relations; when reflection is directed, not to the material, but to the form and order of things as they exist in space." (Schwegler, History of Philosophy, p. 11.)

The progress of human thought in general is closely linked to the capacity to make abstractions from reality, to be able to draw general conclusions from a host of particulars. Since reality is many-sided, it is possible to interpret it in many different ways, reflecting this or that element of the truth. This we see many times in the history of philosophy, where great thinkers laid hold of one aspect of reality, and held it up as an absolute and final truth, only to be swept away by the next generation of thinkers, who in turn repeat the process. Yet the rise and fall of great philosophical schools and scientific theories represents the development and enrichment of human thought by a process of endless successive approximations.

The Pythagoreans approached the world from the standpoint of number and quantity relations. For Pythagoras, "all things are numbers." This idea was linked to the search for the underlying harmony of the universe. They believed that number was the element out of which all things developed. Despite the mystical element, they made important discoveries which greatly stimulated the development of mathematics, especially geometry. They invented the terms odd and even numbers, odd numbers being male and even ones female. Since no women were allowed in the community, they naturally declared odd numbers to be divine and even ones earthly! Likewise, our terms squares and cubes of numbers come from the Pythagoreans, who also discovered harmonic progression in the musical scale, linking the length of a string and the pitch of its vibrating note.

These important discoveries were not put to any practical use by the Pythagoreans, who were interested in geometry purely from an abstract mystical point of view. Yet they had a determining influence on subsequent thought. The mystique of mathematics as an esoteric subject, inaccessible to ordinary mortals, has persisted down to the present day. It was transmitted through the idealist philosophy of Plato, who placed over the entrance of his school the inscription: "Let no man destitute of geometry enter my doors."

"The cosmology of the Pythagoreans," writes professor Farrington, "is very curious and very important. They did not, like the Ionians, try to describe the universe in terms of the behaviour of certain material elements and physical processes. They described it exclusively in terms of number. Aristotle said long afterwards that they took number to be the matter as well as the form of the universe. Numbers constituted the actual stuff of which their world was made. They called a point One, a line Two, a surface Three, a solid Four, according to the minimum number of points necessary to define each of these dimensions." (Farrington, op. cit., p. 47.) They attached magical significance to particular numbers—three, four, seven. Of particular significance was the number ten which is the sum of 1, 2, 3, and 4. These superstitions still persist in the Holy Trinity, the four horsemen of the Apocalypse, the seven deadly sins, and the like. "It is also apparent," adds Bernal, "in modern mathematical physics whenever its adepts try to make god the supreme mathematician." (Bernal, op. cit., p. 124.)

The history of science is characterised by the most fierce partisanship, at times bordering on fanaticism, in defence of particular schools of thought, which put themselves forward as the protagonists of an absolute truth, and who do in fact embody the maximum point reached by human knowledge at a given point in time. Only the further development of science itself reveals the limitations and inner contradictions of a given theory, which is then negated by its opposite, which is itself negated, and so on ad infinitum. This process is precisely the dialectic of the history of science, which for centuries proceeded in tandem with the history of philosophy, and initially was virtually indistinguishable from it.

"All Things Are Numbers"

The development of the quantitative side of investigating nature was obviously of crucial importance. Without it, science would have remained on the level of mere generalities incapable of further development. However, when such a breakthrough takes place, there is inevitably a tendency to make exaggerated claims on its behalf. This is particularly true in this case, where science is still entangled with religion.

The Pythagoreans saw number—quantitative relations—as the essence of all things. "All things are numbers." Indeed, it is possible to explain many natural phenomena in mathematical terms. Nevertheless, even the most advanced mathematical models are only approximations of the real world. The inadequacy of the purely quantitative approach, however, was evident long ago. G. W. F. Hegel, who, as a convinced idealist and a formidable mathematician, might have been expected to be enthusiastic about the Pythagorean school, however, this was far from the case. Hegel poured scorn on the idea that the world could be reduced to quantitative relations.

From Pythagoras onwards, the most extravagant claims have been made on behalf of mathematics, which has been portrayed as the queen of the sciences, the magic key opening all doors of the universe. Breaking free from all contact with crude material reality, mathematics appeared to soar into the heavens, where it acquired a god-like existence, obeying no rule but its own. Thus, the great mathematician Henri PoincarŽ, in the early years of this century, could claim that the laws of science did not relate to the real world at all, but represented arbitrary conventions destined to promote a more

convenient and "useful" description of the corresponding phenomena. Many physicists now openly state that the validity of their mathematical models does not depend upon empirical verification, but on the aesthetic qualities of their equations.

Thus, the theories of mathematics have been, on the one side, the source of tremendous scientific advance, and, on the other, the origin of numerous errors and misconceptions which have had, and are still having profoundly negative consequences. The central error is to attempt to reduce the complex, dynamic and contradictory workings of nature to static, orderly quantitative formulae. Starting with the Pythagoreans, nature is presented in a formalistic manner, as a single-dimentional point, which becomes a line, which becomes a plane, a cube, a sphere, and so on. At first sight, the world of pure mathematics is one of absolute thought, unsullied by contact with material things. But this is far from the truth, as Engels points out. We use the decimal system, not because of logical deduction or "free will," but because we have ten fingers. The word "digital" comes from the Latin word for fingers. And to this day, a schoolboy will secretly count his material fingers beneath a material desk, before arriving at the answer to an abstract mathematical problem. In so doing, the child is unconsciously retracing the way in which early humans learned to count.

The material origins of the abstractions of mathematics were no secret to Aristotle: "The mathematician," he wrote, "investigates abstractions. He eliminates all sensible qualities like weight, density, temperature, etc., leaving only the quantitative and continuous (in one, two or three dimensions) and its essential attributes." (Metaphysics, p. 120.) Elsewhere he says: "Mathematical objects cannot exist apart from sensible (i.e., material) things." (Ibid, p. 251.) And, "We have no experience of anything which consists of lines or planes or points, as we should have if these things were material substances, lines, etc., may be prior in definition to body, but they are not on that account prior in substance." (Ibid, p. 253.)

The development of mathematics is the result of very material human needs. Early man at first had only ten number sounds, precisely because he counted, like a small child, on his fingers. The exception were the Mayas of Central America who had a numerical system based on twenty instead of ten, probably because they counted their toes as well as their fingers. Early man, living in a simple hunter-gatherer society, without money or private property, had no need of large numbers. To convey a number larger than ten, he merely combined some of the ten sounds connected with his fingers. Thus, one more than ten is expressed by "one-ten," (undecim, in Latin, or ein-lifon—"one over"—in early Teutonic, which becomes eleven in modern English). All the other numbers are only combinations of the original ten sounds, with the exception of five additions—hundred, thousand, million, billion and trillion.

The real origin of numbers was already understood by the great English materialist philosopher of the 17th century Thomas Hobbes: "And it seems, there was a time when those names of number were not in use; and men were fayn to apply their fingers of one or both hands, to those things they desired to keep account of; and that thence it proceeded, that now our numerall words are but ten, in any Nation, and in some but five, and then they begin again." (Hobbes, Leviathan, p. 14.)

Alfred Hooper explains: "Just because primitive man invented the same number of number-sounds as he had fingers, our number-scale today is a decimal one, that is, a scale based on ten, and consisting of endless repetitions of the first ten basic number-sounds…Had men been given twelve fingers instead of ten, we should doubtless have a duo-decimal number-scale today, one based on twelve, consisting of endless repetitions of twelve basic number-sounds." (A. Hooper, Makers of Mathematics, p. 4-5.) In fact, a duodecimal system has certain advantages in comparison to the decimal one. Whereas ten can only be exactly divided by two and five, twelve can be divided exactly by two, three, four and six.

The Roman numerals are pictorial representations of fingers. Probably the symbol for five represented the gap between thumb and fingers. The word "calculus" (from which we derive "calculate") means "pebble" in Latin, connected with the method of counting stone beads on an abacus. These, and countless other examples serve to illustrate how mathematics did not arise from the free operation of the human mind, but is the product of a lengthy process of social evolution, trial and error, observation and experiment, which gradually becomes separated out as a body of knowledge of an apparently abstract character.

Similarly, our present systems of weights and measures have been derived from material objects. The origin of the English unit of measurement, the foot, is self-evident, as is the Spanish word for an inch, "pulgada," which means a thumb. The origin of the most basic mathematical symbols + and - has nothing to do with mathematics. They were the signs used in the Middle Ages by the merchants to calculate excess or deficiency of quantities of goods in warehouses.

The need to build dwellings to protect themselves from the elements forced early man to find the best and most practical way of cutting wood so that their ends fitted closely together. This meant the discovery of the right angle and the carpenters' square. The need to build a house on level ground led to the invention of the kind of levelling instrument depicted in Egyptian and Roman tombs, consisting of three pieces of wood joined together in an isosceles triangle, with a cord fastened at the apex. Such simple practical tools were used in the construction of the pyramids. The Egyptian priests accumulated a huge body of mathematical knowledge derived ultimately from such practical activity.

The very word "geometry" betrays its practical origins. It means simply "earth-measurement." The virtue of the Greeks was to give a finished theoretical expression to these discoveries. However, in presenting their theorems as the pure product of logical deduction, they were misleading themselves and future generations. Ultimately, mathematics derives from material reality, and, indeed, could have no application if this were not the case. Even the famous theorem of Pythagoras, known to every school pupil, that a square drawn on the longest side of a right triangle is equal to the sum of the squares drawn on the other two sides, had been already worked out in practice by the Egyptians.

The Pythagoreans, breaking with the Ionian materialist tradition which attempted to generalise on the basis of experience of the real world, asserted that the higher truths of mathematics could not be derived from the world of sensuous experience, but only from

the workings of pure reason, by deduction. Beginning with certain first principles, which have to be taken as true, the philosopher argues them through a series of logical stages until he arrives at a conclusion, using only facts that are agreed first principles, or are derived from such. This was known as a priori reasoning, from the Latin phrase denoting "from what comes first."

Using deduction and a priori reasoning, the Pythagoreans attempted to establish a model of the universe based on perfect forms and governed by divine harmony. The problem is that the forms of the real world are anything but perfect. For instance, they thought that the heavenly bodies were perfect spheres moving in perfect circles. This was a revolutionary advance for its time, but neither of these assertions is really true. The attempt to impose a perfect harmony on the universe, to free it from contradiction, soon broke down even in mathematical terms. Internal contradictions began to surface which led to a crisis of the Pythagorean school.

About the middle of the 5th century, Hippius of Metapontum discovered that the quantitative relations between the side and the diagonal of simple figures like the square and the regular pentagon are incommensurable, that is, they cannot be expressed as a ratio of whole numbers, no matter how great. The square root of two cannot be expressed by any number. It is, in fact, what mathematicians call an "irrational" number. This discovery threw the whole theory into confusion. Hitherto, the Pythagoreans had taught that the world was constructed out of points with magnitude. While it might not be possible to say how many points there were on a given line, still they were assumed to be finite in number. Now if the diagonal and the side of a square are incommensurable, it follows that lines are infinitely divisible, and that the little points from which the universe was built do not exist.

From that time on, the Pythagorean school entered into decline. It split into two rival factions, one of which buried itself in ever more abstruse mathematical speculation, while the other attempted to overcome the contradiction by means of ingenious mathematical innovations which laid the basis for the development of the quantitative sciences.

Chapter Two
The First Dialecticians

Over a hundred years after Darwin, the idea that everything changes is generally accepted among educated people. It was not always so. The theory of evolution by natural selection had to fight a long and bitter struggle against those who defended the biblical view that god created all species in seven days, and that the species were fixed and immutable. For many centuries, the Church dominated science and taught that the earth was fixed at the centre of the universe. Those who disagreed were burnt at the stake.

Even today, however, the idea of change is understood in a one-sided and superficial way. Evolution is interpreted to mean slow, gradual change which precludes sudden leaps. Contradictions are not supposed to exist in nature, and where they arise in human thought are attributed to subjective error. In point of fact, contradictions abound in nature at all levels, and are the basis of all movement and change. This fact was understood by thinkers from the earliest times. It is reflected in some elements of Buddhist philosophy. It underlies the ancient Chinese idea of the principles of ying and yang. In the 4th century B.C., Hui Shih wrote the following lines:

"The sky is as low as the earth; mountains are level with marshes.
The sun is just setting at noon; each creature is just dying at birth."
(Quoted in G. Thomson, The First Philosophers, p. 69.)

Compare this to the following fragments of the founder of Greek dialectical philosophy, Heraclitus (c. 544-484 B.C.):

"Fire lives the death of air, and air lives the death of fire;
Water lives the death of earth, and earth lives the death of water." And
"It is the same thing in us that is living and dead, asleep and awake, young and old; each changes place and becomes the other."
"We step and we do not step into the same stream; we are and are not."

With Heraclitus, the contradictory assertions of the Ionian philosophers for the first time are given a dialectical expression. "Here we see land," commented Hegel, "There is no proposition of Heraclitus which I have not adopted in my Logic." (Hegel, History of Philosophy, Vol. one, p. 279.)

For all his importance, Heraclitus' philosophy has only come down to us in about 130 fragments, written in a difficult aphoristic style. Even in his lifetime, Heraclitus was known as "the Dark" for the obscurity of his sayings. It is almost as if he deliberately chose to make his philosophy inaccessible. Socrates wryly commented that "what he understood was excellent, what not he believed to be equally so, but that the book required a tough swimmer." (Schwegler, p. 20.)

In Anti-Dühring, Engels gives the following appraisal of Heraclitus' dialectical world outlook:

"When we reflect on nature or the history of mankind or our own intellectual activity, at

first we see the picture of an endless maze of connections and interactions, in which nothing remains what, where, and as it was, but everything moves, changes, comes into being and passes away. (At first, therefore, we see the picture as a whole, with its individual parts still more or less kept in the background; we observe the movements, transitions, connections, rather than the things that move, change and are connected.) This primitive, naïve but intrinsically correct conception of the world is that of Greek philosophy, and was first clearly formulated by Heraclitus: everything is and is not, for everything is in flux, is constantly changing, constantly coming into being and passing away." (Engels, op. cit., p. 24.)

Heraclitus lived in Ephesus in the violent period of the 5th century B.C., a period of war and civil strife. Little is known of his life, except that he came from an aristocratic family. But the nature of the period in which he lived is well reflected in one of his fragments: "War is the father of all things and the king of all; and some he has made gods and some men, some bond and some free." (The fragments are here quoted throughout from the Baywater edition, reproduced in Burnet's Early Greek Philosophers.) But Heraclitus here does not just refer to war in human society, but to the role of inner contradiction at all levels of nature as well. Indeed, it is better translated as "strife." He states that: "We must know that war is common to all and strife is justice, and that all things come into being and pass away through strife." All things contain a contradiction, which impels their development. Indeed, without contradiction, there would be no movement and no life.

Heraclitus was the first to give a clear exposition of the idea of the unity of opposites. The Pythagoreans, in fact, had worked out a table of ten antitheses:

1) The finite and the infinite
2) The odd and the even
3) The one and the many
4) The right and the left
5) The male and the female
6) The quiescent and the moving
7) The straight and the crooked
8) Light and darkness
9) Good and evil
10) The square and the parallelogram

These are important concepts, but they were not developed by the Pythagoreans, who satisfied themselves with a mere enumeration. In fact, the Pythagoreans had the position of the fusion of opposites through a "mean," eliminating contradiction by seeking the middle ground. Polemicising against this view, Heraclitus uses a most striking and beautiful image: "Men do not know how what is at variance agrees with itself. It is an attunement of opposite tensions, like that of the bow and the lyre." Contradiction lies at the root of everything. The desire to eliminate contradiction would actually presuppose the elimination of all movement and life, consequently, "Homer was wrong in saying: 'Would that strife might perish from among gods and men!' He did not see that he was praying for the destruction of the universe; for, if his prayer were heard, all things would pass away…"

These are profound thoughts, but are clearly at variance to everyday experience and "common sense." How can something be itself and something else at the same time? How can a thing be both alive and dead? On this kind of argument, Heraclitus poured scorn: "It is wise to hearken, not to me, but to my Word, and to confess that all things are one." "Though this Word is true evermore, yet men are unable to understand it when they hear it for the first time as before they have heard it at all. For, though all things come to pass in accordance to this Word, men seem as if they have no experience of them, when they make trial of words and deeds such as I set forth, dividing each thing according to its kind and showing how it truly is. But other men know not what they are doing when they awake, even as they forget what they do in sleep." "Fools when they do hear are like the deaf; of them does the saying bear witness that they are absent when present." "Eyes and ears are bad witnesses to men if they have souls that understand their language."

What does this mean? The Greek for Word is "Logos," from which logic is derived. Despite its mystical appearance, Heraclitus' opening remark is an appeal to rational objectivity. Do not listen to me, he is saying, but to the objective laws of nature which I describe. That is the essential meaning. And "all things are one?" Throughout the history of philosophy, there have been two ways of interpreting reality—either as one single substance, embodied in different forms (monism, from the Greek word meaning single); or as two entirely different substances, spirit and matter (known as dualism). The early Greek philosophers were materialist monists. Latter, the Pythagorians adopted a dualist position, based upon a supposedly unbridgeable gulf between mind (spirit) and matter. This is the hallmark of all idealism. As we have seen, it has its roots in the primitive superstitions of savages who believed that the soul left the body in dreams.

The above passage is a polemic against the philosophical dualism of the Pythagoreans, against which Heraclitus defends the position of earlier Ionic monism—that there is an underlying material unity of nature. The universe has not been created, but has always existed, in a process of continuous flux and change, whereby things change into their opposites, cause becomes effect, and effect cause. Thus contradiction lies at the root of everything. In order to get at the truth, it is necessary to go beyond the appearances, and lay bear the inner conflicting tendencies of a given phenomenon, in order to understand its inner motive forces.

The ordinary intelligence, by contrast, is content to take things at face value, the reality of sense perception, the "given," the "facts," are accepted without more ado. However, such perception is at best limited, and can be the source of endless errors. To give just one example—for "sound common sense" the world is flat, and the sun goes around the earth. The true nature of things is not always evident. As Heraclitus puts it, "nature loves to hide." In order to arrive at the truth, it is necessary to know how to interpret the information of the senses. "If you do not expect the unexpected, you will not find it," he wrote, and again, "Those who seek for gold dig up much earth and find a little."

"Everything flows," was the basis of his philosophy, "You cannot step twice into the same river; for fresh waters are ever flowing in upon you." This was a dynamic view of the universe, the exact opposite of the static idealist conception of the Pythagoreans. And when Heraclitus looked for a material substance to underpin the universe, following in the footsteps of Thales and Anaximenes, he chose that most elusive and fleeting element,

fire.

The idea that everything is in a constant state of flux, that there is nothing fixed and permanent, except motion and change, is an uncomfortable one for the ordinary cast of mind to accept. Human thinking is, in general, innately conservative. The desire to cling to what is solid, concrete and reliable is rooted in a profound instinct, akin to that of self-preservation. The hope for an after life, the belief in an immortal soul, flows from a rejection of the fact that all things come into existence, and also pass away—"panda rhei," everything flows. Man has stubbornly sought to attain freedom by denying the laws of nature, inventing certain imaginary privileges for himself. True freedom, however, as Hegel explained, consists in correctly understanding these laws, and acting accordingly. It was the great role of Heraclitus to provide the first more or less fully worked-out picture of the dialectical world outlook.

Heraclitus' philosophy was greeted by incredulity and hostility even in his own lifetime. It challenged the assumptions, not only of all religion and tradition, but of the "common sense" mentality which sees no further than the end of its nose. For the next 2,500 years, attempts have been made to disprove it. As Bertrand Russell comments:

"Science, like philosophy, has sought to escape from the doctrine of perpetual flux by finding some permanent substratum amid changing phenomena. Chemistry seemed to satisfy this desire. It was found that fire, which appears to destroy, only transmutes: elements are recombined, but each atom that existed before combustion still exists when the process is completed. Accordingly it was supposed that atoms are indestructible, and that all change in the physical world consists merely in re-arrangement of persistent elements. This view prevailed until the discovery of radio-activity, when it was found that atoms could disintegrate.

"Nothing daunted, the physicists invented new and smaller units, called electrons and protons, out of which atoms were composed; and these units were supposed, for a few years, to have the indestructibility formerly attributed to atoms. Unfortunately it seemed that protons and electrons could meet and explode, forming, not new matter, but a wave of energy spreading through the universe with the velocity of light. Energy had to replace matter as what is permanent. But energy, unlike matter, is not a refinement of the common-sense notion of a 'thing'; it is merely a characteristic of physical processes. It might be fancifully identified with the Heraclitean Fire, but it is the burning, not what burns. 'What burns' has disappeared from modern physics.

"Passing from the small to the large, astronomy no longer allows us to regard the heavenly bodies as everlasting. The planets came out of the sun, and the sun came out of a nebula. It has lasted some time, and will last some time longer; but sooner or later—probably in about a million million years—it will explode, destroying all the planets. So at least the astronomers say; perhaps as the fatal day draws nearer they will find some mistake in their calculations." (B. Russell, op. cit., p. 64-65.)

The Eleatics

In the past it was thought that Heraclitus' philosophy was a reaction against the views of

Parmenides (c. 540-470 B.C.). The prevailing opinion now is that, on the contrary, the Eleatic school represented a reaction against Heraclitus. The Eleatics attempted to disprove the idea that "everything flows" by asserting the direct opposite: that nothing changes, that movement is an illusion. This is a good example of the dialectical character of the evolution of human thought in general, and the history of philosophy in particular. It does not unfold in a straight line, but develops through contradiction, where one theory is put forward, is challenged by its opposite, until this, in turn, is overturned by a new theory, which frequently appears to signify a return to the starting point. However, this apparent return to old ideas does not mean that intellectual development is merely a closed circle. On the contrary, the dialectical process never repeats itself in exactly the same way, since the very process of scientific controversy, discussion, constant re-examination of positions, backed up by observation and experiment, leads to a deepening of our understanding and a closer approximation to the truth.

Elia (or Velia) was a Greek colony in southern Italy founded about 540 B.C. by emigrants fleeing from the Persian invasion of Ionia. According to tradition, the Eleatic school was founded by Xenophones. However, his connection with the school is unclear, and his contribution was overshadowed by its most prominent representatives, Parmenides and Zeno (born 460 B.C.). Whereas the Pythagoreans abstracted from matter all determinate qualities except number, the Eleatics went one step further, taking the process to an extreme, arriving at a totally abstract conception of being, stripped of all concrete manifestations, except bare existence. "Only being is; non being (becoming) is not at all." Pure, unlimited, unchanging, featureless being—this is the essence of the Eleatic thought.

This view of the universe is designed to eliminate all contradictions, all mutability and motion. It is a very consistent philosophy, within its own frame of reference. There is only one snag. It is directly contradicted by the whole of human experience. Not that this worried Parmenides. If human understanding cannot grasp this idea, so much the worse for understanding! Zeno elaborated a famous series of paradoxes designed to prove the impossibility of movement. According to legend, Diogenes the Cynic disproved Zeno’s argument by simply walking up and down the room! However, as generations of logicians have found to their cost, Zeno’s arguments are not so easy to dispose of in theoretical terms.

Hegel points out that the real intention of Zeno was not to deny the reality of motion, but to bring out the contradiction present in movement, and the way it is reflected in thought. In this sense, the Eleatics were, paradoxically, also dialectical philosophers. Defending Zeno against Aristotle’s criticism that he denied the existence of motion, he explains:

"The point is not that there is movement and that this phenomenon exists; the fact that there is movement is as sensually certain as that there are elephants; it is not in this sense that Zeno meant to deny movement. The point in question concerns its truth. Movement, however, is held to be untrue, because the conception of it involves a contradiction; by that he meant to say that no true Being can be predicated in it." (Hegel, History of Philosophy, Vol. 1, p. 266.)

In order to disprove Zeno’s argument, it is not enough to demonstrate that movement

exists, as Diogenes did, just by walking around. It is necessary to proceed from his own premises, to exhaust his own analysis of motion, and carry it to its limits, to the point where it turns into its opposite. That is the real method of dialectical argument, not merely asserting the opposite, still less resorting to ridicule. And, in fact, there is a rational basis for Zeno's paradoxes, which cannot be resolved by the method of formal logic, but only dialectically.

"Achilles the Swift"

Zeno "disproved" motion in different ways. Thus, he argued that a body in motion, before reaching a given point, must first have travelled half the distance. But, before this, it must have travelled half of that half, and so on ad infinitum. Thus, when two bodies are moving in the same direction, and the one behind at a fixed distance from the one in front is moving faster, we assume that it will overtake the other. Not so, says Zeno. "The slower one can never be overtaken by the quicker." This is the famous paradox of Achilles the Swift. Imagine a race between Achilles and a tortoise. Suppose that Achilles can run ten times faster than the tortoise which has 1000 metres start. By the time Achilles has covered 1000 metres, the tortoise will be 100 metres ahead; when Achilles has covered that 100 metres, the tortoise will be one metre ahead; when he covers that distance, the tortoise will be one tenth of a metre ahead, and so on to infinity.

From the standpoint of everyday common sense, this seems absurd. Of course, Achilles will overtake the tortoise! Aristotle remarked that "This proof asserts the same endless divisibility, but it is untrue, for the quick will overtake the slow body if the limits to be traversed be granted to it." Hegel quotes these words, and comments: "This answer is true and contains all that can be said; that is, there are in this representation two periods of time and two distances, which are separated from one another, i.e., they are limited in relation to one another;" but then he adds, "when, on the contrary, we admit that time and space are related to one another as continuous, they are, while being two, not two, but identical." (Hegel, op. cit., p. 273.)

The paradoxes of Zeno do not prove that movement is an illusion, or that Achilles, in practice, will not overtake the tortoise, but they do reveal brilliantly the limitations of the kind of thinking now known as formal logic. The attempt to eliminate all contradiction from reality, as the Eleatics did, inevitably leads to this kind of insoluble paradox, or antimony, as Kant later called it. In order to prove that a line could not consist of an infinite number of points, Zeno claimed that, if it were really so, then Achilles would never overtake the tortoise. There really is a logical problem here. As Alfred Hooper explains:

"This paradox still perplexes even those who know that it is possible to find the sum of an infinite series of numbers forming a geometrical progression whose common ratio is less than 1, and whose terms consequently become smaller and smaller and thus 'converge' on some limiting value." (A. Hooper, Makers of Mathematics, p. 237.)

In fact, Zeno had uncovered a contradiction in mathematical thought which would have to wait two thousand years for a solution. The contradiction relates to the use of the infinite. From Pythagoras right up to the discovery of the differential and integral

calculus in the 17th century, mathematicians went to great lengths to avoid the use of the concept of infinity. Only the great genius Archimedes approached the subject, but still avoided it by using a roundabout method.

The Pythagoreans stumbled on the fact that the square root of two cannot be expressed as a number. They invented ingenious ways of finding successive approximations for it. But, no matter how far the process is taken, you never get an exact answer. The result is always midway between two numbers. The further down the list you go, the closer you get to the value of the square root of two. But the process of successive approximation may be continued forever, without getting a precise result that can be expressed in a whole number.

The Pythagoreans thus had to abandon the idea of a line made up of a finite number of very small points, and accept that a line is made up of an infinite number of points with no dimension. Parmenides approached the issue from a different angle, arguing that a line was indivisible. In order to prove the point, Zeno tried to show the absurd consequences that would follow from the concept of infinite divisibility. For centuries after, mathematicians steered clear of the idea of infinity, until Kepler in the 17th century simply swept aside all logical objections and boldly made use of the infinite in his calculations, to achieve epoch making results.

Ultimately, all these paradoxes are derived from the problem of the continuum. All the attempts to resolve them by means of mathematical theorems, such as the theory of convergent series and the theory of sets have only given rise to new contradictions. In the end, Zeno’s arguments have not been refuted, because they are based on a real contradiction which, from the standpoint of formal logic, cannot be answered. "Even the abstruse arguments put forward by Dedekind (1831-1916), Cantor (1845-1918) and Russell (1872-1970) in their mighty efforts to straighten out the paradoxical problems of infinity into which we are led by our concept of ‘numbers,’ have resulted in the creation of still further paradoxes." (Hooper, op. cit., p. 238.) The breakthrough came in the 17th and 18th centuries, when men like Kepler, Cavalieri, Pascal, Wallis, Newton and Leibniz decided to ignore the numerous difficulties raised by formal logic, and deal with infinitesimal quantities. Without the use of infinity, the whole of modern mathematics, and with it physics, would be unable to function.

The essential problem, highlighted by Zeno’s paradoxes, is the inability of formal logic to grasp movement. Zeno’s paradox of the Arrow takes as an example of movement the parabola traced by an arrow in flight. At any given point in this trajectory, the arrow is considered to be still. But since, by definition, a line consists of a series of points, at each of which the arrow is still, movement is an illusion. The answer to this paradox was given by Hegel.

The notion of movement necessarily involves a contradiction. Consider the movement of a body, Zeno’s arrow for example, from one point to another. When it starts to move, it is no longer at point A. At the same time, it is not yet at point B. Where is it, then? To say that it is "in the middle" conveys nothing, for then it would still be at a point, and therefore at rest. "But," says Hegel, "movement means to be in this place and not to be in it, and thus to be in both alike; and this is the continuity of space and time which first

makes motion possible." (Hegel, op. cit., Vol. 1, p. 273.) As Aristotle shrewdly observed, "It arises from the fact that it is taken for granted that time consists of the Now; for if this is not conceded, the conclusions will not follow." But what is this "now"? If we say the arrow is "here," "now," it has already gone.

Engels writes:

"Motion itself is a contradiction: even simple mechanical change of place can only come about through a body being both in one place and in another place at one and the same moment of time, being in one and the same place and also not in it. And the continual assertion and simultaneous solution of this contradiction is precisely what motion is." (Engels, Anti-Dühring, p. 152.)

The First Atomists

Anaxagoras of Clazomenae, born about 500 B.C., in Asia Minor, in the period of wars with the Medes, and the rise of Athens under Pericles. Anaxagoras moved to Athens where he was a contemporary of Aeschylus, Sophocles, Aristophanes, Diogenes and Protagoras. He was a far more original and profound thinker, who had a tremendous impact on philosophy in Athens. Aristotle said that he was like "a sober man among drunkards." Anaxagoras, following the best Ionian tradition, believed in experiment and observation. "There can be no question," says Farrington, "but that he regarded sense-evidence as indispensable for the investigation of nature, but, like Empedocles, he was concerned to show that there were physical processes too subtle for our senses to perceive directly." (B. Farrington, Greek Science, p. 62.)

His scientific discoveries were of the first order. He believed that the sun was a mass of molten elements, as also were the stars, although these were too far away for their heat to be felt. The moon was nearer, and made of the same material as the earth. The light of the moon was a reflection of the sun, and eclipses were caused by the moon blocking off the sun’s light. Like Socrates later, he was accused of atheism, probably accurately, since he scarcely mentions religion in his cosmology. These revolutionary ideas shocked the conservative Athenians, eventually leading to Anaxagoras’ banishment.

In opposition to Parmenides, Anaxagoras held that everything is infinitely divisible, and that even the smallest amount of matter contains some of each element. He also considered that matter was made up of particles of many kinds. Thus he asked how it occurs that bread, when eaten, turns into bones, flesh, blood, skin, and the rest. The only explanation was that the particles of wheat must contain, in some hidden form, all the elements necessary for the make up of the body, which are rearranged in the digestive process.

He believed there to be an infinite number of elements or "seeds." But there was one of them which played a special role. This was the nous, usually translated as "mind." Lighter than the other elements, it is, unlike the rest, unmixed, and permeates all matter, as an organising and animating principle. For this reason, Anaxagoras is usually regarded as an idealist. But this is far from certain. The arch-idealist Hegel considered that, while the nous was an important step in the direction of idealism, "with Anaxagoras it was not

fully worked out." (Hegel, History, Vol. one, p. 330.) Anaxagoras' nous can also have a materialistic interpretation, as the inner moving spirit of matter, or, more correctly expressed, energy. Hegel himself understood that it did not mean an external intelligence, but the objective processes which take place within nature, providing it with form and definition.

The idea that matter consists of an infinity of tiny particles, invisible to the senses, represents a most important generalisation, and a transition to the atomic theory, that remarkable anticipation of modern science, first expounded by Leucippus (c. 500-440 B.C.) and Democritus (c. 460-370 B.C.). The breakthrough was even more astonishing when we bear in mind that these thinkers had no access to electron microscopes, or any other technological aids. There was therefore no means of corroborating the theory, let alone developing it at that time. More importantly, it incurred the wrath of the religious, and the scorn of the idealists, and was allowed to sink without trace in the long, dark night of the Middle Ages, until, like so many ideas of Antiquity, it was rediscovered by the thinkers of the Renaissance, like Gassendi, where it played an important role in stimulating the new scientific outlook.

About Leucippus, so little is known that some even doubted his existence, which, however was proved by the discovery of papyri at Herculaneum. Most of his sayings have come down to us through the writings of other philosophers. In a startlingly new hypothesis, Leucippus stated that the whole universe was made up of just two things, atoms and the void, an absolute vacuum. He was also the first to establish what later became known as the law of causality and the law of sufficient reason. The one authentic fragment which has survived says: "Naught happens for nothing, but everything from a ground and necessity." (Burnet, Early Greek Philosophers, p. 340). The early atomists were determinists. They placed causality firmly at the centre of all natural processes, but they did so in an unbending way, reminiscent of the later mechanical determinism of Laplace. This rigidity of the earliest atomists was later corrected by Epicurus, who put forward the idea that atoms falling through the void swerve slightly, thus introducing the element of accident into the framework of necessity.

The atomists derived all things from an infinite number of fundamental particles, the "atoma" (which means "that which cannot be divided"). These atoms were alike in quality, but unlike in quantity, differing only in size, shape and weight, although the smallness of their size made it impossible to see them. In essence, this was correct. The entire physical world, from coal to diamonds, from the human body to the scent of roses, is composed of atoms of different sizes and weights, arranged in molecules. Present day science can give a precise quantitative expression to this assertion. The Greek atomists were in no position to do this, because the limitation upon the development of technology inherent in the slave method of production prevented the proper utilisation of the brilliant inventions of the time, including the steam engine, which mostly remained on the level of toys and curiosities. All the more remarkable, then, was the way in which they anticipated one of the most important principles of 20th century science.

The celebrated American physicist Richard P. Feynman, underlines the place of atomic theory in present day science:

"If, in some cataclysm, all of scientific knowledge were to be destroyed, and only one sentence passed onto the next generations of creatures, what statement would contain the most information in the fewest words? I believe it is the atomic hypothesis (or the atomic fact, or whatever you wish to call it) that all things are made of atoms—little particles that move around in perpetual motion, attracting each other when they are a little distance apart, but repelling upon being squeezed into one another. In that one sentence, you will see, there is an enormous amount of information about the world, if just a little imagination and thinking are applied." (Feynman, Lectures on Physics, 1-3.)

And again:

"Everything is made of atoms. That is the key hypothesis. The most important hypothesis in all of biology, for example, is that everything that animals do, atoms do. In other words, there is nothing that living things do that cannot be understood from the point of view that they are made of atoms acting according to the laws of physics. This was not known from the beginning: it took some experimenting and theorising to suggest this hypothesis, but now it is accepted, and it is the most useful theory for producing new ideas in the field of biology.

"If a piece of steel or a piece of salt, consisting of atoms one next to the other, can have such interesting properties; if water—which is nothing but these little blobs, mile upon mile of the same thing over the earth—can form waves and foam, and make rushing noises and strange patterns as it runs over cement; if all of this, all the life of a stream of water, can be nothing but a pile of atoms, how much more is possible? If instead of arranging the atoms in some definite pattern, again and again repeated, on and on, or even forming little lumps of complexity like the odour of violets, we make an arrangement which is always different from place to place, with different kinds of atoms arranged in many ways, continually changing, not repeating, how much more marvelously is it possible that this thing might behave? Is it possible that that ‘thing’ walking back and forth in front of you, talking to you, is a great glob of these atoms in a very complex arrangement, such that the sheer complexity of it staggers the imagination as to what it can do? When we say we are a pile of atoms, we do not mean we are merely a pile of atoms, because a pile of atoms which is not repeated from one to the other might well have the possibilities which you see before you in the mirror." (Ibid., 1-13.)

The world outlook of the Greek atomists was naturally materialist. This earned them the hatred of the idealists and the religiously-inclined. A particularly spiteful campaign of calumny was directed against Epicurus, whose philosophical views were so distorted for centuries as to turn them into their exact opposite in the popular imagination. They were self-confessed atheists. There is no room for god in this view of the universe. Democritus found the cause of mutation and change in the nature of the atoms themselves, falling through the vacuum (the "void"), they impinge on one another, arranging themselves in different ways, like combining with like.

Through an endless series of different combinations, we get the constant changes which are everywhere to be seen in nature, and which give rise to the transitoriness of worldly things. There was an infinite number of worlds "born and dying," not created by god, but arising and being destroyed out of necessity, in accordance with natural laws. Knowledge

of these things is derived mainly from sensory perception, but this gives us only a "dim" understanding of nature. It must be supplemented and transcended by "bright" reason, which leads to the cognition of the essence of things, the atoms and the void. The fundamental elements of a scientific materialist world outlook are all present in these few lines.

The philosophy of Democritus was further developed and deepened by Epicurus. Like his mentor, he explicitly denied the interference of the gods in the affairs of the world, basing himself on the eternity of matter, in a state of continual motion. However, he rejected the mechanistic determinism of Leucippus and Democritus, introducing the idea of a spontaneous (internally conditioned) "deviation" of the atoms from their course, in order to explain the possibility of collisions between atoms moving at equal speed through empty space. This was an important step forward, posing the dialectical relation between necessity and chance—one of the key theoretical questions over which modern physics is still wracking its brains, although the solution was found long ago by Hegel.

Epicurus' theory of knowledge is based entirely on acceptance of the information given to us by the senses. All senses are "heralds of the true," nor is there anything that can refute the senses. Here his presentation, while starting from a correct assumption—I interpret the world through my senses—represents a step back in relation to Democritus. It is too one-sided. Sense perception is undoubtedly the basis of all knowledge, but it is necessary to know how to interpret correctly the information of the senses. That is what Heraclitus meant when he said that eyes and ears are bad witnesses to men who have barbarian souls. The narrow empirical approach invariably leads to errors. Thus, according to Cicero, Democritus thought that the sun was immensely large, whereas Epicurus believed it to be only about two feet in diameter. In other respects, however, Epicurus made some startling discoveries. Gassendi, who may be considered the father of modern atomism, praised Epicurus because, exclusively by reasoning, he showed the fact later demonstrated by experiment, that all bodies, irrespective of their mass and weight, have the same velocity when falling from above to below.

Lucretius on Religion

Epicurus and his followers declared war upon religion which feeds off men's fear and ignorance. The first book of Lucretius' great philosophical poem The Nature of the Universe contains what amounts to a materialist and atheist manifesto:

"When human life lay grovelling in all men's sight, crushed to the earth under the dead weight of superstition whose grim features loured menacingly upon mortals from the four quarters of the sky, a man of Greece was first to raise mortal eyes in defiance, first to stand erect and brave the challenge. Fables of the gods did not crush him, nor the lightning flash and the growling menace of the sky. Rather, they quickened his manhood, so that he, first of all men, longed to smash the constraining locks of nature's doors. The vital vigour of his mind prevailed. He ventured far out beyond the flaming ramparts of the world and voyaged in mind throughout infinity. Returning victorious, he proclaimed to us what can be and what cannot: how a limit is fixed to the power of everything and an immovable frontier post. Therefore superstition in its turn lies crushed beneath his feet, and we by his triumph are lifted level with the skies." (Lucretius, The Nature of the

Universe, p. 29.)

Even here, the religious prejudices of the translator are apparent. He cannot bring himself to translate the word "religio" as religion, preferring to render it as "superstition." This, in 1951! The materialist philosophy of Epicurus made a big impact on the young Karl Marx, who chose it as the subject of his doctoral dissertation while at university. Marx considered that the Roman philosopher-poet Lucretius was "the only one in general of all the ancients who has understood Epicurean physics," who has written "a more profound exposition." (Marx-Engels, Collected Works, Vol. 1, p. 48, referred to hereafter as the MECW.)

In the most striking poetic language, Lucretius defends the indestructibility of matter, the correct idea that matter can neither be created nor destroyed:

"This dread and darkness of the mind cannot be dispelled by the sunbeams, the shining shafts of day, but only by an understanding of the outward form and inner workings of nature. In tackling this theme, our starting-point will be this principle: Nothing can ever be created by divine power out of nothing. The reason why all mortals are so gripped by fear is that they see all sorts of things happening on the earth and in the sky with no discernible cause, and these they attribute to the will of a god. Accordingly, when we have seen that nothing can be created out of nothing, we shall then have a clearer picture of the path ahead, the problem of how things are created and ocassioned without the aid of the gods." (Lucretius, op, cit. p.)

The law of the conservation of energy, proved by Mayer, Joule, Helmholz and others in the mid-19th century shows that the total amount of energy neither disappears nor is created, when changing from one kind to another. This provides an unshakable basis for the materialist position that matter can neither be created nor destroyed. This idea is also brilliantly conveyed by Lucretius:

"The second great principle is this: nature resolves everything into its component atoms and never reduces anything to nothing. If anything were perishable in all its parts, anything might perish all of a sudden and vanish from sight. There would be no need of any force to separate its parts and loosen their links. In actual fact, since everything is composed of indestructible seeds, nature obviously does not allow anything to perish till it has encountered a force that shatters it with a blow or creeps into chinks and unknits it." (The Nature of the Universe, p. 33.)

The Epicurean world view maintains that the universe is infinite, and matter has no limit, either externally or internally:

"If there are no such least parts, even the smallest bodies will consist of an infinite number of parts, since they can always be halved and their halves halved again without limit. On this showing, what difference will there be between the whole universe and the very least of things? None at all. For, however endlessly infinite the universe may be, yet the smallest things will equally consist of an infinite number of parts. (ibid., p. 45.)

And: "Learn, therefore, that the universe is not bounded in any direction. If it were, it would necessarily have a limit somewhere. But clearly a thing cannot have a limit unless

there is something outside to limit it, so that the eye can follow it up to a certain point but not beyond. Since you must admit that there is nothing outside the universe, it can have no limit and is accordingly without end or measure." (ibid., p. 55.)

If the scientists of our own century had had an equally sound philosophical outlook, we would have been spared the most glaring errors of method, such as the search for the "bricks of matter," the "big bang" with its finite universe, the "birth of time," the equally absurd "continuous creation of matter," and the like. In relation to time, Democritus stated that time had no origin, that it does not exist in itself, apart from the movement of things or things at rest. How infinitely more scientific than certain present-day physicists who talk about the alleged "beginning of time" 20 billion years ago! In their apparatus, they are more advanced, but in their mode of thinking, they are worlds behind the early materialists.

The consistent materialist outlook of Epicurus earned him the most venomous attacks of the Church from the earliest times. The apostle Paul specifically mentions them in the Acts of the Apostles, xvii, 18. In Dante's time, the accusation of Epicureanism meant someone who denied the Holy Ghost and the immortality of the soul. In general, Epicurus is thought to have advocated an amoral and hedonistic philosophy, in which all manner of gluttony and licentiousness was permitted. All this is just a crude slander against Epicurus and his philosophy.

In terms of morality and ethics, the Epicurean philosophy represents one of the noblest products of the human spirit. It resembles the famous dictum of Spinoza: "Neither weep nor laugh, but understand." Epicurus sought to free humanity from fear, by promoting a clear understanding of nature, and man's place in it. He asked himself what is the basis of all fear, and answered, the fear of death. His main aim was to eliminate this fear, by explaining that death is nothing for me in the present, for I am alive, and will be nothing to me in the future, since, after death, I can know nothing about it. Therefore, he enjoined men to set aside fear of death and live life to the full. This beautiful and humane philosophy has always been anathema to those who wish to direct the eyes of men and women away from the problems of the real world to an alleged world after death, which is supposed to reward or punish us according to our just deserts.

The accusation of grossness and hedonism against Epicurus stems from the vengeful attitude of the Christian apologists against a cheerful and life-enhancing philosophy—the exact opposite of their own. They sought to bury their enemy under a heap of slander. In fact, Epicurus, like Spinoza, identified the good with pleasure, or the absence of pain. He considered human relations from the point of view of utility, which finds its highest expression in friendship. In a period of great social turbulence and uncertainty, he preached withdrawal from the world, and a life of peaceful meditation. He recommended men to reduce their needs to a minimum, away from the world of strife, competition and war. This was, of course, an utopian idea, but it is nothing to do with the ugly and spiteful caricature put in circulation by the opponents of materialism. Epicurus remained true to his ideals on his deathbed, from where he wrote: "A happy day is this on which I write to you…The pains which I feel…could not be greater. But all of this is opposed by the happiness which the soul experiences, remembering our conversations of a bygone time."

The Rise of Idealism

The term "dialectics" comes from the Greek "dialektike," derived from "dialegomai," to converse, or discuss. Originally, it signified the art of discussion, which may be seen in its highest form in the Socratic dialogues of Plato. This was no accident, but flowed from the very nature of Athenian democracy, with its ample scope for oratory and debate in public assemblies. This gave rise to a new breed of public figures, professional teachers and speakers of all kinds, from courageous freethinkers and profound philosophers to unscrupulous demagogues.

The words "sophist" and "sophistry" to modern ears have a thoroughly disreputable ring about them, suggesting intellectual dishonesty, trickery and lies, masked by clever turns of phrase. That, indeed, was how sophism ended up. But it was not always so. In a way, they can be compared to the philosophers of the French Enlightenment in the 18th century. They were rationalists and freethinkers, who stood opposed to all existing dogmas and orthodoxy. Their maxim was "Doubt Everything." All existing things and ideas had to be subjected to the most far-reaching criticism. This undoubtedly contained a revolutionary and dialectical kernel. "On this new-found field now the Sophists disported, enjoying with boyish exuberance the exercise of the power of subjectivity, and destroying, by means of a subjective dialectic, all that had been ever objectively established." (Schwegler, History of Philosophy, p. 30.)

The activities of the sophists reflected life in Athens during the period of the Peloponesian war between Athens and Sparta. They were both scholars and practical men, the first ones to charge a fee for teaching. Plato remarks in the Republic that the doctrines of the Sophists express only the same principles which guided the practice of the multitude in their civil and social relations. The hate with which they were persecuted by the statesmen proves the jealousy with which the latter saw them. The sophists were attacked for saying that morality and truth were subjective concepts, which could be determined by anyone, according to his personal preferences and interests. But they were only saying what was already the established norm in practice. We see the same thing today. Professional politicians do not like to be reminded of the moral code which really operates in the corridors of power!

"Public life was becoming an arena of passion and self-seeking," writes Schwegler, "the party-strifes, which agitated Athens during the Peloponesian war, had blunted and stifled the moral sentiment; every one accustomed himself to set his own private interest above that of the state and of the common good, and to seek in his own self-will and his own advantage the standard of his action and the principle of his guidance. The axiom of Protagoras, man is the measure of all things, was in practice only all too truly followed, while the influence of rhetoric in public assemblies and decisions, the corruption of the masses and their leaders, the weak points which cupidity, vanity, and party-spirit betrayed to the crafty, offered only all too much occasion for its exercise.

"What was established, and had come down so, had lost its authority, political regulation appeared as arbitrary restriction, moral principle as a result of calculated political training, faith in the gods as human invention for the intimidation of free activity, piety as a statute of human origin which every man had a right to alter by the art of persuasion.

This reduction of the necessity and universality of nature and reason to the contingency of mere human appointment, is mainly the point where the Sophists are in contact with the general consciousness of the cultivated classes of the time; and it is impossible to decide what share theory had here, and what practice; whether the Sophists only found practical life in a theoretical formula, or whether the social corruption was rather a consequence of the destructive influence which the Sophists exercised over the entire circle of the opinions of their contemporaries." (Schwegler, History of Philosophy, p. 31.)

The turbulence of the times, with constant changes, wars, destruction and unrest, found a reflection in the restless spirit of dialectical contradiction. The unsettling movement of thought, upsetting existing ideas mirrored the actual conditions of Greece at the time of the Peloponesian wars. Likewise, the need to win over the assembly or law-court by clever argument provided a material base for the rise of a generation of professional orators and dialecticians. But that is not to say that the initial content of sophism was determined by considerations of personal advantage or pecuniary gain, any more than was, say, Calvinism. But, given the prevailing social conditions, the later development of sophism was determined in advance.

The first generation of sophists were genuine philosophers, often identified with democratic politics and with a materialist understanding of nature. They were rationalists and encyclopaedists, just as their French equivalents in the decades before 1789. And in the same way, they were clever and witty, with an ability to deal with all sides of a problem. Protagoras was celebrated as a teacher of morals, Gorgias as a rhetorician and politician, Prodicus as a grammarian and etymologist, and Hippias as a polymath. They were to be found in all the professions and spheres of knowledge. But gradually the movement, which really never constituted a real school, began to degenerate. The wandering "wise man" going from town to town in search of good pay and a rich patron became a figure of contempt and ridicule.

The common feature of all the previous schools of thought examined here is their objectivity, the assumption that the validity of our ideas depends on the degree to which they correspond to objective reality, to the world outside us. The sophists broke entirely from this, advancing instead the position of philosophical subjectivity. This is well summed up in the celebrated phrase of Protagoras (481-411 B.C.), "Man is the measure of all things; of those which are, that they are; of those which are not, that they are not."

There is some dispute about the exact meaning of this phrase, which may also be put in a way which implies that Protagoras was a materialist, a view which fits in with a remark of Sextus Empiricus, to the effect that Protagoras said that "the main causes (‘logoses’) of all things are in matter." But there can be no doubt that the general trend of sophism was in the direction of extreme subjectivism. As a result of their withering attacks on existing beliefs and prejudices, they were regarded as subversives in conservative circles. Protagoras himself was expelled from Athens for atheism, and his book On the Gods was burnt.

Religious conviction and its philosophical counterpart, dogmatism, is not culture. Even Heraclitus, despite his great wisdom, was not free from a dogmatic and narrow cast of mind, as shown by the tone of his utterances. But no real progress is possible along this

path. Sophism, therefore, at least in its first period, played a positive role in breaking down the old universal dogmas into their component parts and counterposing each of the parts to the others. There was a negative side, in that the isolated elements were open to be twisted and turned out of context, in a typically "sophist" way. Yet, as Hegel says, "A man of culture…knows how to say something of everything, to find points of view in all." (Hegel, History of Philosophy, Vol. 1, p. 356.) In fact, Hegel thought that the arguments of Protagoras in Plato's dialogue of that name were superior to those of Socrates.

This kind of esprit (wit) is entirely foreign to the Anglo-Saxon tradition and mentality, which generally regards it with ill-concealed suspicion, and distaste. Yet, as Hegel, penetratingly observes, sophism marks the beginning of culture in the modern sense of the word. For culture presupposes a rational consideration of things and a choice.

"In fact, what is most striking in a man or people of culture is the art of speaking well, or of turning subjects round and considering them in many aspects. The uncultivated man finds it unpleasant to associate with people who know how to grasp and express every point of view with ease. The French are good speakers in this sense, and the Germans call their talking prattle; but it is not mere talk that brings about this result, for culture is also wanted. We may have mastered a speech quite completely, but if we have not culture, it is not good speaking. Men thus learn French, not only to be able to speak French well, but to acquire French culture. What is to be obtained from the Sophists is thus the power of keeping the manifold points of view present to the mind, so that the wealth of categories by which an object may be considered, immediately occurs to it." (Ibid., p. 359.)

Despite the disrepute in which sophism is supposed to be held nowadays, it is the true father of modern professional politics, law and diplomacy. We observe with tedious regularity how bourgeois politicians are prepared to defend with apparently total conviction, now one position, now precisely the opposite, adducing in either case the most impressive moral and practical arguments. The same procedure may be observed in the law courts any day of the week. And why bother the reader with a list of examples of the consummate lying, manoeuvring deceit practised by the diplomatic corps of every government in the world? These people have all the faults of the sophists and none of their virtues!

It is true that the sophists made a living out of their nimble wits and ability to argue for or against almost anything, as a lawyer argues for the defence or the prosecution, irrespective of the intrinsic rights and wrongs of the case (the verb "sophizesthai" meant "making a career by being clever"). They were the prototype of the smart lawyer and the professional politician. But they were much more than that. Even in the more morally questionable activities of the sophists, there was a real philosophical principle involved. As Hegel wittily observes:

"In the worst action there exists a point of view which is essentially real; if this is brought to the front, men excuse and vindicate the action…A man does not require to make great progress in his education to have good reasons ready for his worst actions; all that has happened in the world since the time of Adam has been justified by some good reason."

(Ibid., p. 369.)

The basic idea which underlies the dialectic of sophism is that truth is many-sided. This is an extremely important truth, and fundamental to the dialectical method in general. The difference lies in the use to which it is put. Scientific, objective dialectics strives to grasp every phenomenon in an all-round manner. Subjective dialectics, the dialectic of sophism, takes one or another aspect of the whole, and counterposes it to the rest. In this way, it is possible to deny the whole by insisting on the part, which, in itself, is perfectly sound. This is the method of the legal charlatan, the eclectic, and also, in a cruder way, of "common sense," which makes arbitrary assumptions based upon particulars.

They tried to use the arguments of Zeno and Heraclitus to justify their views, but did so in a negative and one-sided way. For example, Heraclitus had said that it is impossible to step in the same stream twice. One of his disciples went further, saying that you could not even step into it once! This, however, is false. The idea of Heraclitus was that everything is and is not, because everything is in flux, constantly changing. The second view merely takes one half of the equation—that everything is not. This is not at all what Heraclitus meant. The objective world certainly exists, but it is in a permanent process of motion, development and change, in which nothing remains as it was before.

The sophists were sceptics. "As to the gods," wrote Protagoras, "I am unable to say whether they are or are not; for there is much which prevents this knowledge, both in the obscurity of the matter, and in the life of man which is so short." That sentence got him banished from Athens. The fundamental difference with the earlier philosophy is the subjective character of the sophist outlook. "Man is the measure of all things." This statement may be taken in two ways, practical and theoretical. In the first sense, it can be taken as a defence of egotism, self-interest, and the like. In the second sense, it represents a theory of knowledge (epistemology) which is subjective. Man counterposes himself to the objective world, and, at least in his imagination, subjects it to himself. His own reason decides what is what. The essential thing is not what is, but how I see it. This is the basis of all forms of subjective idealism, from Protagoras to Bishop Berkeley, from Kant to Werner Heisenberg.

Basically, the subjective idealist claims that the world is unknowable. We can have no real grasp of the truth, but only opinions, based on subjective criteria. "The truth?" asked Pontius Pilate ironically, "What is the truth?" That is the language of the cynical politician and bureaucrat, who hides his self-interest behind a thin veneer of "cultured" sophistry. Philosophically speaking, however, it is an expression of subjective idealism, which denies the possibility of really knowing the world outside us. This outlook was most clearly expressed by one of the most famous sophists, Gorgias of Leontini (483-375 B.C.), who wrote a provocatively-titled book—On Nature, or On That Which Is Not. The title already says it all. Gorgias based himself on three propositions: a) nothing is real, b) if anything were real, it could not be known, and c) if it could be known, it could not be expressed.

Such opinions seem absurd. Yet they have repeatedly surfaced in the history of philosophy in different forms, including in our own times, when even respected scientists can permit themselves to assert that humans cannot comprehend the quantum world of

sub-atomic particles, and that photons and electrons only materialise in a given spot when they are observed by someone; that is, the observer creates his result through the subjective act of observation. Here we once again depart from the world of objectivity, and return, through the tradesman's entrance of subjective idealism, to the realms of religious mysticism.

The present-day scientists who advocate such views have far less excuse than the sophists, who were the children of their time. The early attempts to find a rational explanation for the processes of nature had reached a point where they could not be taken any further by thought alone. The thinkers of that period arrived at a series of brilliant generalisations about the nature of the universe. But in order to test them and develop them further, it was necessary to examine them in detail, to break them down into their component parts, to analyse them one by one. This work was started by the sophists, and later put on a more rigorous basis by Aristotle. The heroic period of great generalisations gradually gave way to the slow and painstaking accumulation of facts, experiment and observation. Only in this way could the truth or falsehood of the different hypotheses be finally demonstrated. Before we reach this stage, however, we come to the high point of classical philosophical idealism.

Socrates and Plato

By subordinating the objective world to subjectivity, the sophists had stripped it of all inherent law and necessity. The sole source of order, rationality and causation was the perceiving subject. Everything was declared to be relative. For example, they held that morality and social conduct was determined by convenience (a similar view is held by the Pragmatists, a philosophy which enjoyed a lot of support in the United States, and which fits in nicely with the need to make morality compatible with the ethics of the "free enterprise" jungle). Thrasymachus of Chalcedon in the late 5th century B.C. openly declared that "right is what is beneficial for the stronger or better one."

This was another period of war, revolution and counterrevolution. In 411 B. C., after a hundred years of slave-owning democracy, there was a revolution in Athens, followed by a counter-coup two years later. There followed a disastrous war with Sparta, which imposed the rule of the "Thirty Tyrants," under which numerous atrocities were perpetrated by the aristocratic party in power. But by 399 B. C., the Thirty had been overthrown, and Socrates, who had the misfortune to have had several of them as his pupils and friends, was put on trial and sentenced to death.

Socrates (469-399 B.C.) was regarded by his contemporaries as a sophist, although he did not teach for money. Though he wrote nothing—his ideas have come down to us through the writings of Plato and Aristotle—he had a huge influence on the development of philosophy. His origins were humble; he was the son of a stonemason and a midwife. The motive force of his life was a burning desire to get at the truth, tearing aside all pretences and sophistry by a relentless process of question and answer. It is said that, in his attempt to get people to think about universal principles, he went about the workplaces of artisans and merchants, as well as the haunts of sophists and youths, subjecting all to the same procedure.

The method was always the same: setting out from a particular idea or opinion, usually derived from the concrete experiences and problems of life of the person involved, he would, step by step, by a rigorous process of argument, bring to light the inner contradictions contained on the original proposition, show its limitations, and take the discussion to a higher level, involving an entirely different proposition. This is the dialectic of discussion in its classical form. An initial argument (thesis) is advanced. This is answered by a contrary argument (antithesis). Finally, after examining the question thoroughly, dissecting it to reveal its inner contradictions, we arrive at a conclusion on a higher level (synthesis). This may or may not mean that the two sides reach agreement. But in the very process of developing the discussion itself, the understanding of both sides is deepened, and the discussion proceeds from a lower to a higher level.

The same dialectical process of the development of thought through contradiction can be seen in the history of science and philosophy. It was graphically expressed by Hegel in the Preface to his pioneering work The Phenomenology of Mind:

"The bud disappears when the blossom breaks through, and we might say that the former is refuted by the latter; in the same way when the fruit comes, the blossom may be explained to be a false form of the plant's existence, for the fruit appears as its true nature in place of the blossom. These stages are not merely differentiated; they supplant one another as being incompatible with one another. But the ceaseless activity of their own inherent nature makes them at the same time moments of an organic unity, where they not merely do not contradict one another, but where one is as necessary as the other; and this equal necessity of all moments constitutes alone and thereby the like of the whole." (Hegel, The Phenomenology of Mind, p. 68.)

It is possible to say that in the Socratic dialogues we do not find a worked out exposition of dialectics, but we do find many important examples of the dialectical method in action. The celebrated Socratic irony, for example, is not just a stylistic trick, but a reflection of the dialectic itself. Socrates wished to make other people become aware of the contradictions underlying their own ideas, beliefs and prejudices. From each definite proposition, he deduced as a direct result, the exact opposite of what the proposition stated. Instead of merely attacking his opponents' ideas, he would put them in a position where they themselves would draw the opposite conclusion. This is precisely the basis of irony, not just here, but in general. This dialectic of discussion is an art which was perfected by Socrates. He himself likens it to the art of midwifery, which he jokingly claimed to have learnt from his mother. It is, to quote Hegel, "the assisting into the world of the thought which is already contained in the consciousness of the individual—the showing from the concrete, unreflected consciousness, the universality of the concrete, or from the universally posited, the opposite which is already in it." (Hegel, History of Philosophy, Vol. 1, p. 402.)

In just the same way, the task of Marxists is not to introduce into the working class a socialist consciousness "from without," as some have imagined, but to proceed from the existing state of awareness of the class, and show concretely, step by step, how the problems which workers face can only be resolved by a radical transformation of society. It is not a question of preaching from without, but of making conscious the unconscious aspiration of working people to change society. The difference is that this process is not

brought to fruition exclusively in the debating chamber, but by practical activity, struggle and the experience of the class itself. The problem, nevertheless, remains essentially the same: how to break down existing prejudices and get people to see the contradictions present, not only in their heads, but in the world in which they live—to get them to see things as they really are, not as they imagine them to be.

Socrates would begin with the most self-evident, everyday, even trivial facts given to us by our senses. Then he would compare these with other facts, proceeding from one detail to the next, and in this way, gradually eliminating all accidental and secondary aspects, until, finally, we are brought face to face with the essence of the question. This is the method of induction, proceeding from the particular to the universal, a most important method for the development of science. Aristotle explicitly credits Socrates with the invention (or, at least, perfection) of the method of induction and logical definitions which are closely related to it.

The search for the general which lies hidden within the particular is one of the most important aspects of the development of human thought in general. Starting with elementary sense perception which registers individual facts and circumstances, the human mind begins slowly and painfully to abstract from these particulars, discarding the inessential, until it finally arrives at a series of more or less abstract generalisations. Though these "universals" have no existence separate and apart from the particular things that embody them, they nonetheless represent the essential being of things, expressing a far truer and deeper truth than the particular. The progress of human thought in general is closely related to the ability to generalise on the basis of experience, and to arrive at abstract ideas which correspond to the nature of reality.

In his autobiography, Trotsky touches on this question:

"Later, the feeling of the supremacy of the general over the particular became an integral part of my literary and political work. The dull empiricism, the unashamed cringing worship of the fact which is so often only imaginary, and falsely interpreted at that were odious to me. Beyond the facts, I looked for laws. Naturally, this led me more than once into hasty and incorrect generalisations, especially in my younger years, when my knowledge, book-acquired, and my experience in life were still inadequate. But in every sphere, barring none, I felt that I could move and act only when I held in my hand the thread of the general." (Trotsky, My Life, p. 88.)

The aim of Socrates was to proceed, by means of logical argumentation, from the particular to the general, to arrive at the "universal." For him, this was no longer a question of getting to the most general laws governing nature, as was the case with earlier Greek philosophers, but rather of man examining himself, his own nature, his thought and actions. The philosophy of Socrates is not the philosophy of nature but the philosophy of society, above all of ethics and morality. His favourite subject is "What is the Good?" In reality, this question can only be answered concretely, with reference to the historical development of society, since there is no such thing as a supra-historical morality. This can be seen clearly in the case of ancient Greece, where the very language betrays the historical relativity of morality. The Greek word for goodness "arete," like its Latin equivalent, "virtus" (from which we get the English "virtue") originally meant something

like combative manliness. As J. D. Bernal points out: "It took a long time to soften into the ideal of citizenship and still longer to Christian submissiveness." (J. D. Bernal, op. cit., p. 135.)

Nonetheless, what is important is not the subject matter of these dialogues, but the method. This really represents the birth of logic, which was originally the handling of words (Greek "logoi"). Thus, logic and dialectics were originally the same—a technique for getting at the truth. The method involved breaking up concepts into their constituent parts, revealing their inner contradictions, and putting them back together again. It was a dynamic process, with even a certain element of drama and surprise. The first reaction to the discovery of a fundamental contradiction in previously held ideas is one of surprise. For example, the idea that motion implies being and not being in the same place at the same time. The dialectic constantly challenges what appeared at first sight to be unquestionable. It shows the limitations of vulgar thinking, "common sense" and superficial appeals to the "facts," which, as Trotsky rightly remarked, are "so often imaginary, and falsely interpreted."

The task of going beyond the particular, of breaking down the information provided by our eyes and ears, and arriving at abstract generalisations lies at the root of the development and growth of human thought, not only in a historical sense, but in the evolution of every individual in the arduous struggle to pass from childhood to conscious maturity. In the writings of Plato (428-348 B.C.) the search for the general, the "universal," becomes the central issue of philosophy to the exclusion of all else, one might say almost an obsession. In these works, profound thoughts, a brilliant style and some masterly examples of the dialectic of discussion are mixed up with the most blatant and mystifying idealism ever produced by the human mind.

For Plato, the universals of thought, for example, the idea of a circle, had an independent existence, separate and apart from particular round objects. From a materialist stand point, as we have seen, the idea of a circle was originally derived from the observation of round objects over a long period of time. Not so, says Plato. If one looks at any example of a round object, for instance the plate on this table, it will be seen to be imperfect. It is therefore only a poor copy of the perfect circle that existed before the world began. For a class of wealthy intellectuals, used to working only with thoughts and words, it was logical that these should appear to them to be endowed with a life and a power of their own:

"The emphasis on the discussion of words and their true meanings tended to give to words a reality independent of the things and actions to which they referred. Because there is a word for beauty, beauty itself must be real. Indeed it must be more real than any beautiful thing. This is because no beautiful thing is altogether beautiful, and so whether it is beautiful or not is a matter of opinion, whereas beauty contains nothing but itself and must exist independently of anything in this changing and imperfect material world. The same logic applies to concrete things: a stone in general must be more real than any particular stone." (Bernal, op. cit., p. 138.)

Plato’s Idealism

In his work Phaedo, Plato develops this idea in a consistent way. If we ask what the cause of a thing is, we end up with its essence—the Greek word is "eidos," which can be variously translated as form or idea, although Aristotle interprets it as "species," which is obviously preferable from a materialist standpoint. To go back to our dinner-plate. What makes it round? or—to use Platonic language—What is the cause of its roundness? One might answer, that it was caused by a potter rotating a lump of clay on a wheel and moulding it with his hand. But for Plato, the plate, like all other crude material objects, is merely an imperfect manifestation of the Idea, which, put in plain language, is God.

Plato's theory of knowledge, which Aristotle says is different from that of Socrates, was based on the idea that the object of knowledge must be permanent, eternal, and since nothing under the sun is permanent, we must seek stable knowledge outside this fleeting and deceitful world of material things. When Diogenes ridiculed the theory of Ideas, by saying he could see the cup, but not "cupness," Plato retorted that that was because he had eyes to see, but no intellect. And it is true that merely to base oneself on sense-perception is not enough. It is necessary to go from the particular to the universal. The fundamental flaw here is to think that the generalisations of the intellect can stand on their own, divorced from, and counterposed to, the material world from which, ultimately, they are derived.

Marx and Engels in The Holy Family explained: in the philosophy of Idealism, the real relations between thought and being are stood on their head, "for the absolute idealist, in order to be an absolute idealist, must necessarily constantly go through the sophistical process of first transforming the world outside himself into an appearance, a mere fancy of his brain, and afterwards declaring this fantasy to be what it really is, i.e., a mere fantasy, so as finally to be able to proclaim his sole, exclusive existence, which is no longer disturbed even by the semblance of an external world." (MECW, Vol. 4, p. 140.)

The sophistical trick whereby this is done was wittily explained in the same work:

"If from real apples, pears, strawberries and almonds I form the general idea 'Fruit,' if I go further and imagine that my abstract idea 'Fruit,' derived from real fruit, is an entity existing outside me, is indeed the true essence of the pear, the apple, etc., then—in the language of speculative philosophy—I am declaring that 'Fruit' is the 'Substance' of the pear, the apple, the almond, etc. I am saying, therefore, that to be a pear is not essential to the pear, that to be an apple is not essential to the apple; that what is essential to these things is not their real existence, perceptible to the senses, but the essence that I have abstracted from them and then foisted on them, the essence of my idea—'Fruit.' I therefore declare apples, pears, almonds, etc., to be mere forms of existence, modi, of 'Fruit.' My finite understanding supported by my senses does of course distinguish an apple from a pear and a pear from an almond, but my speculative reason declares these sensuous differences inessential and irrelevant. It sees in the apple the same as in the pear, and in the pear the same as in the almond, namely 'Fruit.' Particular real fruits are no more than semblances whose true essence is 'the substance'—'Fruit.' (Ibid, pp. 57-8.)

Far from advancing the cause of human understanding, the idealist method does not take us a single step forward. Only a study of the real, that is to say, material world, can deepen our understanding of nature and our place in it. By directing men's eyes away

from "crude" material things towards the realm of so-called "pure" abstraction, the idealists played havoc with the development of science for centuries. "By this method one attains no particular wealth of definition. The mineralogist whose science was limited to the statement that all minerals are really ‘the Mineral’ would be a mineralogist only in his imagination. For every mineral the speculative mineralogist says ‘the Mineral,’ and his science is reduced to repeating this word as many times as there are real minerals." (Ibid.)

As opposed to the earlier Greek philosophers, who were generally materialists, and set out from a study of nature, Plato consciously turned his back on the world of the senses. Not experiment and observation, but only pure deduction and mathematics was the road to truth. Above the entrance of his Academy in Athens he placed the inscription: "Let no man destitute of geometry enter my doors." Plato encouraged his students, for example, to study the stars, not as they are, but as they ought to be. Following in the footsteps of the Pythagoreans, he alleged that the planets showed their divine nature by their eternally unchanging orbits, the perfect regularity of their circular motion being an expression of the harmony of the universe. This cosmology, together with that of Aristotle, his great successor, held back the development of astronomy for 2,000 years. It represented a retreat from science to Pythagorean mysticism. Thus, in an Alexandrian hand-book on astronomy written by Geminus, we read:

"There underlies the whole science of astronomy,…the assumption that the sun and the moon and the five planets move at even speeds in perfect circles in an opposite direction to the cosmos. It was the Pythagoreans, the first to approach these questions, who laid down the hypothesis of a circular and uniform motion for the sun, moon, and planets. Their view was that, in regard of divine and eternal beings, a supposition of such disorder as that these bodies should move now more quickly and now more slowly, or should even stop, as in what are called the stations of the planets, is inadmissible. Even in the human sphere such irregularity is incompatible with the orderly procedure of a gentleman. And even if the crude necessities of life often impose upon men occasions of haste or loitering, it is not to be supposed that such occasions inhere in the incorruptible nature of the stars. For this reason they defined their problem as the explanation of the phenomena on the hypothesis of circular and uniform motion." (Farrington, Greek Science, pp. 95-6.)

Kepler discovered that the planets moved, not in circles, but in ellipses. Even this was not completely true, as Newton later showed. The ellipses are not perfect, either. But for the previous two millennia, the idealist picture of the universe held the force of an unchallengeable dogma. For much of that time it was backed by the formidable power of the Church.

It is significant that the ideas of Plato were known in the Middle Ages through only one work, the Timaeus, his worst book. This represents a complete counter-revolution in philosophy. From Thales on, Greek philosophy was characterised by an attempt to explain the world in natural terms, without recourse to the gods or any supernatural phenomena. The Timaeus is not a work of philosophy but a religious tract. Here we see a revival of "all the old crap," as Marx once put it. It is, in effect, the revival of the old creation myth. The world was created by a Supreme Craftsman. Matter consists of triangles because solids are bounded by planes, and planes can be resolved into triangles.

The world is spherical and moves in circles because the circle is the most perfect form. Men who live badly are reborn as women in the next reincarnation, and so on and so forth.

In a passage strikingly similar to some of the statements of the present-day defenders of the "big bang," Plato writes about the "beginning of time":

"Time, then, and the heaven came into being at the same instant in order that, having been created together, if ever there was to be a dissolution of them, they might be dissolved together. It was framed after the pattern of the eternal nature, that it might resemble this as far as was possible; for the pattern exists from eternity, and the created heaven has been, and is, and will be, in all time. Such was the mind and thought of God in the creation of time." (The Dialogues of Plato, Jowett's edition, Vol. 3, Timaeus, p. 242.) No wonder the Christian Church welcomed this with open arms!

Despite its dialectical side, the Platonic philosophy is essentially a conservative one, reflecting the world outlook of an aristocratic elite, who felt, correctly, that their world was crumbling about them. The urge to turn one's back on reality, to deny the evidence of one's senses, to cling to some kind of stability in the midst of turbulence and upheaval, to deny change, all this clearly corresponded to a powerful psychological and moral need.

Chapter Three
Aristotle and the End of Classical Greek Philosophy

"The greatest thinker of antiquity," Marx called him. Aristotle lived from 384 to 322 B.C., and was born, not in Athens but in Stagira, Thrace. Originally a pupil of Plato, he made a thorough study of his philosophy over a period of twenty years, but evidently became dissatisfied with it. After Plato's death, he left the Academy and later became the tutor of Alexander. He returned to Athens in 335 B.C., to found his own school, the Lyceum. His was an encyclopaedic mind, encompassing a huge number of subjects—logic, rhetoric, ethics, political sciences, biology, physics and metaphysics ("what comes after physics," the study of first principles and presuppositions). He is the real founder of logic, natural history, the theory of morals, and even of economics.

The philosophy of Aristotle marks a sharp break with that of Plato. In many ways it is diametrically opposed to it. Instead of the idealist method, which turns its back upon reality in order to take refuge in a world of perfect ideas and forms, Aristotle proceeds from the concrete facts of sense perception, and from these arrives at ultimate grounds and principles. Whereas Plato started with ideas, and tried to explain reality from them, Aristotle sets out from reality, carefully examining a large number of facts and phenomena, in order to derive from them a series of general inferences. That is to say, he used the method of induction.

Aristotle's interest in physics and biology is an illustration of his general approach, his love of experiment and observation as the main source of knowledge. In this, he was a pioneer of the modern scientific method. When Alexander the Great was engaged on his wars of conquest, he arranged to send back to Aristotle details and drawings of all new discoveries of plants and animals. What a difference to Plato, who regarded the crude material world of nature as unworthy of his attention! Aristotle spent many years collecting, arranging, and classifying information from all manner of spheres.

Aristotle, however, did not merely collect facts. Basing himself on information derived from the objective material world, he proceeded to generalise. In his most profound work, the Metaphysics, he speculates on the meaning of universal notions. In the process, he sums up and criticises previous philosophies, and therefore may also be regarded as the first historian of philosophy. It should be borne in mind that this has nothing to do with the use of the word "metaphysics" in the writings of Marx and Engels, where it is used in an entirely different sense—as a way of describing the narrow mechanical outlook of the non-dialectical materialist philosophers of the 18th and 19th centuries. In fact, the "metaphysics" of Aristotle occupies a similar place to dialectics in the philosophy of Plato.

In the Metaphysics, Aristotle for the first time provides a systematic account of some of the basic categories of dialectics. This fact is often overlooked, because he also laid down the laws of formal ("Aristotelian") logic, which, at first sight, appear to stand in contradiction to dialectics. In point of fact, for Aristotle, logic and dialectics were both valid ways of thinking. This is, in fact, the case. Dialectical thinking does not contradict

formal logic, but complements it. More correctly, the laws of formal logic hold good within certain limits, beyond which they break down. In particular, formal logic, based on the law of identity, cannot adequately deal with motion, which involves a contradiction—something which formal logic explicitly rules out. For a whole series of operations in everyday life, the rules of formal logic hold good and play a useful role. But when the attempt is made to apply these laws and thought-forms to areas where they conflict with reality, they turn into their opposite. Far from helping us to understand the workings of nature, they become an endless source of error, holding back the development of science and knowledge.

The whole of formal logic is based on three propositions, which make up the basic Aristotelian syllogism:

1) the law of identity ("A" = "A")
2) the law of contradiction ("A" is not "not-A"), and
3) the law of the excluded middle ("A" is not "B")

For more than 2,000 years, this has been the corner-stone of all logic. Towards the end of the 18th century, Kant was able to say that logic, since Aristotle, had not made any step forward or any step back. Despite all the changes experienced by science in that period, the rules of logic remained petrified, in the forms worked out by Aristotle, and later converted into a dogma by the mediaeval Church. Yet the basic Aristotelian syllogism upon which the whole edifice is constructed is based on a false premise. In the first place, despite the appearance of a logical progression, this is an illusion. All three assertions are, in fact, already contained in the first one, "A" is "A." Everything stands or falls with this, the "law of identity."

At first sight, the truth of this proposition would appear to be self-evident. Like the law of contradiction, which is merely a negative way of saying the same thing, it seems to brook no dissent. "There are some who maintain (a) that the same thing can be and not be, and (b) that it is possible so to judge. Many physicists too, have used language to this effect. Now we have just assumed that a thing cannot both be and not be, and have also shown this to be the most indubitable of all principles. The demand that we should prove the law argues a defective education in logic—a science which enables one to recognise what requires proof and what does not. It is absolutely impossible to have proof of everything: the process would continue indefinitely, and the result would be no proof of anything whatsoever. Granted, on the other hand, that there are some things which do not call for proof, what principle, I ask, is more self-evident than the law of contradiction?" (Aristotle, Metaphysics, p. 125.)

It is interesting to note that here Aristotle, who is normally most concerned to prove each of his postulates by a rigorous process of argument, makes no attempt to prove the law of contradiction, but merely asserts it dogmatically. It is just to be accepted as "common sense." But, upon closer examination, the matter is not at all as simple as it is presented. In real life, a thing is and is not equal to itself, because it is constantly changing. You are in no doubt that you are you. But in the time you have taken to read these lines, billions of changes have taken place in your body—cells have died and been replaced. The body consists of tissue, which is constantly breaking down and being replaced, eliminating

waste matter and bacteria, excreting carbon dioxide through the lungs, losing water in sweat and urine, and so on. These constant changes are the basis of all life. They mean that, at any moment, the body is itself and also something different to itself. So you are not the same person you were. Nor is it possible to get round this by arguing that you are you at this precise moment in time, since even in the smallest portion of time, change takes place.

For normal purposes, we can accept that "A = A," that you are you, and nobody else. The reason is that the kind of change we are referring to is so small that it can be ignored for normal purposes. However, over a longer period, twenty years, for instance, a difference would be noticed. And in a hundred years, the difference would be quite sufficient for one to conclude that you are not you at all! Moreover, this does not only apply to living things. Inorganic matter is also in a state of constant change, so that everything is and is not, because, to use Heraclitus' marvellous expression "everything is in flux."

For ordinary everyday purposes, we can accept the law of identity. Indeed, it is absolutely indispensable, if thought is not to dissolve into utter confusion. But for more accurate calculations, or higher velocities approaching the speed of light, or for a whole series of critical situations, it proves inadequate. At a certain point, an accumulation of small, quantitative changes gives rise to a fundamental change in quality. All of this remains a closed book to formal logic, the fundamental weakness of which is an inability to deal with things in their movement and life.

Similarly with the law of the excluded middle, which states that it is necessary either to assert or deny, that a thing must be either black or white, either alive or dead, either "A" or "B." It cannot be both at the same time. For normal everyday purposes, we can take this to be true. Indeed, without such assumptions, clear and consistent thought would be impossible. In the period of decadence of sophism, it became customary to play with dialectics in an arbitrary way, which so twisted the method of reasoning as to be able to prove practically any opinion. Aristotle was determined to clear up the mess caused by the subjective dialectics of sophism, hence his insistence on elementary logical propositions.

Nevertheless, when we depart from the realm of everyday experience and consider more complex processes, it is by no means such a simple matter to distinguish "A" from "B." The dogmatic insistence on eliminating contradiction leads precisely to the metaphysical mode of thought in the specific sense understood by Marx and Engels, as explained in Anti-Dühring, which points out the limitations of the laws of formal logic when faced with the contradictory reality of nature:

"To the metaphysician, things and their mental images, ideas, are isolated, to be considered one after the other and apart from each other, fixed, rigid objects of investigation given once for all. He thinks in absolutely unmediated antitheses. 'His communication is 'yea, yea; nay, nay'; for whatsoever is more than these cometh of evil.' For him a thing either exists or does not exist; a thing cannot at the same time be itself and something else. Positive and negative absolutely exclude one another; cause and effect stand in a rigid antithesis one to the other.

"At first sight this way of thinking seems to us most plausible because it is that of so-called sound common sense. Yet sound common sense, respectable fellow that he is in the homely realm of his own four walls, has very wonderful adventures directly he ventures out into the wide world of research. The metaphysical mode of thought, justifiable and even necessary as it is in a number of domains whose extent varies according to the nature of the object, invariably bumps into a limit sooner or later, beyond which it becomes one-sided, restricted, abstract, lost in insoluble contradictions, because in the presence of individual things it forgets their connections; because in the presence of their existence it forgets their coming into being and passing away; because in their state of rest it forgets their motion. It cannot see the wood for the trees. For everyday purposes we know and can definitely say, e.g., whether an animal is alive or not. But, upon closer inquiry, we find that this is sometimes a very complex question, as the jurists very well know. They have cudgelled their brains in vain to discover a rational limit beyond which the killing of the child in its mother's womb is murder. It is just as impossible to determine the moment of death, for physiology proves that death is not a sudden instantaneous phenomenon, but a very protracted process.

"In like manner, every organic being is every moment the same and not the same; every moment it assimilates matter supplied from without and gets rid of other matter; every moment some cells of its body die and others build themselves anew; in a longer or shorter time the matter of its body die and others build themselves anew in a longer or shorter time the matter of its body is completely renewed and is replaced by other molecules of matter, so that every organic being is always itself, and yet something other than itself.

"Further, we find upon closer investigation that the two poles of an antithesis, like positive and negative, are as inseparable as they are opposed, and that despite all their opposition, they interpenetrate. In like manner, we find that cause and effect are conceptions which only hold good in their application to the individual case as such; but as soon as we consider the individual case in its general connection with the universe as a whole, they merge, they dissolve in the concept of universal action and reaction in which causes and effects are constantly changing places, so that what is effect here and now will be cause there and then, and vice versa.

"None of these processes and modes of thought fit into the frame of metaphysical thinking. But for dialectics, which grasps things and their conceptual images essentially in their interconnection, in their concatenation, their motion, their coming into and passing out of existence, such processes as those mentioned above are so many corroborations of its own procedure." (Engels, op. cit., pp. 26-7.)

It is unfortunate, but not unique, that the brilliant, original thought of a genius became ossified and impoverished in the hands of his successors. The flexible, dialectical aspect of Aristotle's method, with its emphasis on observation and experiment was lost sight of for a long time. The mediaeval Schoolmen, interested only in providing an ideological basis for the doctrines of the Church, concentrated on his logic, interpreted in a lifeless and formalistic way, to the exclusion of practically all else. Thus, a body of ideas which ought to have provided a healthy stimulus to the development of science, was turned into its opposite—a set of chains for the intellect, which was only shattered by the

revolutionary upsurge of the Renaissance.

There is something profoundly ironical about the hijacking of Aristotle by the Church. In fact, his writings are impregnated with a strongly materialist spirit. Lenin considered that "Aristotle comes very close to materialism." (Lenin, Collected Works, Vol. 38, p. 282.) Thus, unlike Plato, in Aristotle, formal logic is closely connected to the theory of being and the theory of knowledge, because he saw the forms of thought as being, not independently existing phenomena, but forms of being, expressed in human consciousness.

Aristotle totally rejected Plato's theory of ideas as disembodied forms. The aim of science is, of course, to generalise on the basis of experience. But the general only exists in and through the material things given to us in sense perception. He rightly understood the limitations of the early materialists like Thales who attempted to express the material world in terms of a single concrete manifestation, such as water. He saw matter as an eternal substance, which is always changing, which cannot be created or destroyed, with neither beginning or end, but which is in a constant process of change and transformation. One of his main objections to Plato's idealism is that non-material ("non-sensible") things can have no movement: "But this is quite inadmissible; a heaven…without movement is unthinkable; yet a non-sensible heaven can have no movement." (Aristotle, Metaphysics, p. 94.)

Aristotle's penetrating mind detected an insoluble contradiction in Plato's idealism. If there really existed unchanging, eternal forms, how did they succeed in giving rise to the constantly moving, changing material world we see before us? Out of such an immobile idea, entirely devoid of any principle of motion, one can derive nothing at all, except a complete standstill. Nothing comes into being, without a moving force, either from within itself or from without, as Newton found out, when he assigned God the task of providing the initial impulse to get his mechanical universe moving. But here there is nothing of the sort. Plato's Ideas have no motion in them. But since all things move and change, these allegedly perfect ideas suffer from the greatest imperfection of all. They do not exist. More correctly, they do not exist anywhere except as phantoms in the brains of philosophers.

The absolute separation between thought and being, that peculiar schizophrenia which afflicts all brands of idealism ultimately leads it to impotence, since there is no real way in which the Absolute Idea which is supposed to stand above the world of crude material reality can affect the latter, or impinge upon it in any way whatever. As Schwegler remarks:

"The supporters of the Ideal Theory, then, are not in a position logically to determine any idea; their ideas are indefinable. Plato has left in complete obscurity the relation in general of things to the ideas. He terms the ideas archetypes, and supposes things to participate in them; but such expressions are only hollow poetical metaphors. How are we to conceive this 'participation' in, this copying of, these patterns thus remote, absent in an alien region? It is in vain to seek in Plato any definite explanation here. It is wholly unintelligible how and why matter comes to participate in the ideas." (Schwegler, op. cit., p. 104.)

In his struggle against the subjectivism of the sophists, Socrates laid stress on the need to look for universal ideas, and arrive at correct conceptions and definitions which really correspond to the subject matter under consideration. This was an advance as against the arbitrary method of the sophists. Indeed, without such universals, science in general would be impossible. However, Plato's attempt to transform these general notions into independent entities led straight into the swamp of religious mysticism. What we are really dealing with here, under the heading of "universals" is the genus and species of things. The notion that a genus or species can exist separate and apart from the individuals that comprise it, or vice versa, is a self-evident nonsense. Aristotle rejected the notion that forms and ideas can exist separate from material things:

"While the Ideal Theory involves us in numerous difficulties, its greatest absurdity is the doctrine that there are entities apart from those in the sensible universe, and that they are the same as sensible things except that the former are eternal while the latter are perishable. Those who uphold this view are saying in effect that there is an absolute Man, and Horse, and Hearth. They follow closely in the footsteps of those who teach that there are gods, but in human form; for as the latter merely set up eternal men, so the former do no more than make the Forms eternal sensibles." (Aristotle, Metaphysics, pp. 93-4.)

With enormous patience and intellectual rigour, Aristotle went through all the categories of thought, which he expressed in a far more developed and explicit way than had hitherto been the case. Many of the categories of dialectical thought later developed in Hegel's Logic are already dealt with in outline by Aristotle—Being, Quantity and Quality, Part and Whole, Necessity and Accident, Potential and Actual, and so on. There are many important insights here. For example, in the discussion of the relation between potentiality ("dynamis") and actuality ("energeia"), Aristotle anticipates the idea of the unity of matter and energy. For Aristotle, matter consists of two aspects, substance, which contains within itself the potential for an infinite number of transformations, and a kind of active principle, "energeia," which is an innate and spontaneous moving force. In developing the idea of the movement of potential being into actual being, Aristotle gives a more concrete version of the "becoming" of Heraclitus. Here we have the main point of difference between the philosophy of Aristotle and that of Plato. In place of the static, lifeless Idea, we have an inherent tendency of matter towards movement and development, which realises itself by constantly passing from potentiality to actuality.

In relation to time, Aristotle shows himself to be superior, not only to Plato, but to many modern scientists, who talk mystical nonsense about the "beginning of time." He points out that time, like motion, has always existed, and that, consequently, it is absurd to talk of the beginning or end of time:

"It is impossible, however, that motion should be generable or perishable; it must always have existed. Nor can time come into being or cease to be; for there cannot be a "before" or "after" where there is no time. Movement, then, is also continuous in the sense in which time is, for time is either the same thing as motion or an attribute of it." (Ibid., p. 342.) This is a profound thought, and one that anticipates the position of dialectical materialism, that time, space and motion are the mode of existence of matter, although Aristotle was unable to develop this idea in a satisfactory way.

Starting out from the position of objective idealism, Aristotle came quite close to materialism, although he never managed to make a complete break; as Lenin comments, he wavered "between idealism and materialism." (Lenin, Collected Works, Vol. 38, p. 286.) In the writings of Aristotle, we find the germs of a materialist conception of history and the development of thought and culture. He explains that, while the actions of animals are determined by immediate sense-impressions (the things they can see, hear, etc.) and memory, only the human race lives by shared, social experience, art and science. While the starting point of all knowledge is experience and sense-perception, that is not enough:

"Wisdom, again, is not to be identified with sense-perception which, though it is our primary source of knowledge of particulars, can never tell us why anything is so (e.g., why fire is hot), but only that it is so." Aristotle, op. cit., p. 52.)

The theory of knowledge of Aristotle also comes close to a materialist position. The starting point is the facts and phenomena given to us through our senses (in sense-perception), passing from the particular to the universal, "so that in this case we have to start from what is more intelligible to ourselves (i.e., the complex facts and objects of experience) and advance to the understanding of what is of its nature intelligible (i.e., the simple, universal principles of scientific knowledge)." (Ibid., p. 172.)

The inconsistency of Aristotle's position is revealed in the concessions he makes to religion, in assigning to God the role of the First Cause. Anticipating Newton, he argued that there must be something which originates motion, and this something must itself be unmoved. This "something," however, must be an eternal substance and actuality. The concept is ambiguous, rather like the "substance" of Spinoza. It is open to the same objections levelled by Aristotle against Plato. For if the universe was once without motion—something which is impossible—there is no way it could be made to move, unless by an external impulse. But if the "unmoved First Mover" is not material, it is impossible that it should impart motion to a material universe.

Moreover, this line of argument does not solve the problem posed, but merely shifts it back one stage. Let us accept that the "First Cause" set the universe in motion. What caused the "First Cause"? This question is not supposed to be asked. The answer is allegedly given in advance by the phrase "unmoved First Mover," which, of course, answers nothing. The weakness of the whole argument is self-evident, and flows from Aristotle's preoccupation with the search for final causes (as opposed to what he called material, formal and efficient causes). Within certain limits, for everyday purposes, it is possible to do this with a fair degree of satisfaction. For example, the causes of the existence of a house can be traced to the building materials, the builders, the architect, and so on.

In fact, however, it is possible to go on tracing the causes of even the simplest phenomenon indefinitely. Even in the given example, we could go on to specify the demand for housing, the state of the world economy, the atomic composition of the bricks and cement, the parents and grandparents of all the people involved, and so on and so forth. For practical purposes, we choose not to do this, placing a definite limit on causality. But, in reality, the chain of causation is endless, cause becoming effect, and

vice versa, ad infinitum. Thus, the very conception of a "First Cause" is unscientific and mystical. Naturally, this weakest side of Aristotle was seized upon and elevated to the rank of dogma by the Church.

Another misconception in Aristotle, related to the above, was the teleological interpretation of nature. Teleology (from the Greek word telos, an end) holds that all natural phenomena, including man, are determined by an ultimate goal or purpose. This mistaken notion played a negative role in holding back science, since it cannot really explain anything. Moreover, it leads to religious conclusions, because one has to say where this "purpose" came from. The conclusion is drawn that the goal of things is determined by God.

Aristotle himself did not approach things in this way, although it suited the Church later on to give it a religious interpretation. To him, everything contained within itself an active principle, or "soul" ("entelechy"), and the whole of nature is guided by a single supreme goal. This idea probably comes from Aristotle's investigations of biology. In his works, he mentions some 500 different types of animals, of which he himself dissected about fifty different types. From close observation, he noted how the body structure of animals is perfectly adapted to their environment and mode of existence. From such observations, Darwin arrived at the theory of evolution. But Aristotle drew a different conclusion, namely that the nature of each animal is predetermined by Nature in accordance with a given order, a plan almost, which is inherent in the nature of things. Thus, Aristotle ascribes the body to a divine plan:

"Man alone of all the animals is erect, because his nature and his substance are divine. To think, to exercise intelligence, is the characteristic of that which is most divine. This is not easy if much of the body is situated in the upper part. For weight renders the exercise of thought and perception sluggish. Accordingly, if the weight and the bodily element increase, bodies must bow down to earth; then, for security, nature must substitute forelegs for hands and arms, and we get quadrupeds...But man being erect has no need of forelegs; instead of them nature has given him hands and arms. Now Anaxagoras has said that it is the possession of hands that has made man the most intelligent of the animals. The probability is that it was because he was the most intelligent that he got hands. For hands are a tool, and nature, like an intelligent man, always distributes tools to those that can use them. The proper thing is to give a genuine flute-player a flute rather than to give a man who happens to have a flute the skill to play, for that is to add the lesser to the greater and more august instead of adding the greater and more precious to the lesser. If, then, it is best that it should be so, and if nature, out of what is possible always does the best, it is not because he has hands that man is wise, but because he is the wisest of the animals he has hands." (From Parts of Animals, quoted in Farrington, p. 129-130.)

The idea of Anaxagoras, that the development of human intelligence was made possible by the freeing of the hands was a marvellous insight, but Aristotle completely stands it on its head. His teleological approach prevented him from arriving at a genuinely scientific appraisal of nature, in spite of the vast extent of his researches. Taken over by Thomas Aquinas and the Church, it held back the study of nature for centuries, until Darwin's discoveries gave a rational explanation of the relative purpose of living creatures. Even so, teleological conceptions in biology resurfaced in different guises—neo-vitalism, neo-

Lamarckism, etc. The same tendency is often expressed even today by people who, when attempting to describe natural phenomena, unconsciously endow "Nature" with human characteristics, as if it "made" animals and plants, and got them to behave in a certain way. In reality, the "purposefulness" displayed by plants and animals is the process of optimum adaptation of living objects to their surroundings, and not at all the product of a preordained plan.

Greek Science in the Alexandrine Period

The barrenness of idealist philosophy is shown by the fact that it was incapable of further development. Plato's philosophy ended with the death of Plato. His Academy was taken over by a series of second-raters, who contributed nothing new to the development of thought. This was not the case with Aristotle's Lyceum. His emphasis on investigation stimulated his pupils to engage in fruitful practical research. The voluminous studies in different fields bequeathed by the Master laid the basis for the development of various sciences. The great museum of Alexandria was an offshoot of the Lyceum, which produced important treatises on botany, physics, anatomy, physiology, mathematics, astronomy, geography, mechanics, music and grammar.

Aristotle's first successor, Theophrastus, made a breakthrough in biology, being the first to draw a firm distinction between plants and animals to establish the science of botany. Theophrastus also began to question the validity of teleology, and proposed to place a limit on its application to biology:

"We must try to set a limit on the assigning of final causes," he wrote. "This is the prerequisite of all scientific inquiry into the universe, that is, into the conditions of existence of real things and their relations with one another." (See Farrington, p. 162.)

He went back to the materialist explanations of the pre-Socratic philosophers, in order to overcome the contradictions in which Aristotle had found himself in relation to matter and movement.

Strato, who was head of the Lyceum from 287 to 267 B.C., can be considered the father of scientific experiment. According to Polybius, he earned the nickname "The Physicist," which at that time denoted anyone interested in the investigation of nature. Cicero says, in a disapproving tone, that he "abandoned ethics, which is the most necessary part of philosophy, and devoted himself to the investigation of nature" (ibid, p. 182). In 1893, Hermann Diels analysed a fragment attributed to Hero of Alexandria, the Pneumatics, written in the second half of the 1st century A.D., which clearly lays down the basis of the experimental method worked out by Strato.

The scientists of the Alexandrine period made great advances in all fields of knowledge. In mechanics, for example, they produced mathematical explanations of a whole host of operations: the lever, the balance, the pulley, the potter's wheel, the wedge, the oars of a boat, the problem of inertia, etc. In the field of botany, the work of Theostratus remained without parallel until modern times, according to Farrington. Strato is now considered to be the author of the document Mechanical Problems, originally attributed to Aristotle, which contains the germ of an important principle of mechanics, the principle of virtual

velocities (the principle of virtual displacements). Erastothenes calculated the circumference of the earth, using scientific methods, and appears to have come within 0.4% of the correct result. Hero of Alexandria even invented a steam engine, although it could not be put to use. The question invariably arises in our minds why such extraordinary discoveries did not lead to a technological and industrial revolution 2,000 years ago. The answer to this question lies in the nature of the slave economy itself.

In general, with certain exceptions like mining, war engines and public works, the rulers of Greece and Rome were uninterested in the application of scientific discoveries for practical purposes. In the period when slavery became the dominant mode of production, the divorce between science and technology was almost total. Philosophical and scientific speculation was regarded as an intellectual pastime for the wealthy. Philosophers and mathematicians looked with contempt at the men of practical affairs. Euclid, the great geometrician, when asked by an incautious pupil what he would gain by studying geometry, ordered a slave to give him a few coins, "since he must make a gain out of what he learns." In point of fact, no practical use was found for Euclid’s theories until the 17th century, when Galileo discovered that projectiles move in parabolas and Kepler found that planets move in ellipses.

With an abundance of cheap slave labour, there was no incentive to move towards labour-saving technology. The market for refined products was restricted to a small class of wealthy people. The question of mass production therefore did not arise. Even in agriculture, which in the later period of Roman history was based on large-scale latifundia, there was a disincentive to introduce machinery. First, because of the abundant supply of slaves, and second, because the slaves, unlike free labourers, could not be relied upon to look after delicate and costly machines. In a perceptive footnote in the first volume of Capital, Marx explains the reason for the impossibility of introducing advanced technology on the basis of slavery:

"This is one of the circumstances that makes production by slave labour such a costly process. The labourer here is, to use a striking expression of the ancients, distinguishable only as instrumentum vocale, from an animal as instrumentum semi-vocale, and from an implement as instrumentum mutum. But he himself takes care to let both beast and implement feel that he is none of them, but is a man. He convinces himself with immense satisfaction, that he is a different being, by treating the one unmercifully and damaging the other con amore. Hence the principle, universally applied in this method of production, only to employ the rudest and heaviest implements and such as are difficult to damage owing to their sheer clumsiness. In the slave-states bordering on the Gulf of Mexico, down to the date of the civil war, ploughs constructed on old Chinese models, which turned up the soil like a hog or a mole, instead of making furrows, were alone to be found. (Conf. J. E. Cairnes, The Slave Power, London, 1862, p. 46 sqq.) In his Sea Board Slave States, Olmsted tell us: "I am here shown tools that no man in his senses, with us, would allow a labourer, for whom he was paying wages, to be encumbered with; and the excessive weight and clumsiness of which, I would judge, would make work at least ten per cent greater than with those ordinarily used with us. And I am assured that, in the careless and clumsy way they must be used by the slaves, anything lighter or less rude could not be furnished them with good economy, and that such tools as we constantly

give our labourers and find our profit in giving them, would not last out a day in a Virginia cornfield—much lighter and more free from stones though it be than ours. So, too, when I ask why mules are so universally substituted for horses on the farm, the first reason given, and confessedly the most conclusive one, is that horses cannot bear the treatment that they always must get from Negroes; horses are always soon foundered or crippled by them, while mules will bear cudgelling, or lose a meal or two now and then, and not be materially injured, and they do not take cold or get sick, if neglected or overworked. But I do not need to go further than to the window of the room in which I am writing, to see at almost any time, treatment of cattle that would ensure the immediate discharge of the driver by almost any farmer owning them in the North." (Capital, Vol. 1, p. 196, note.)

The rise of slavery undermined the free peasantry, crushed by military service, debt, and the competition of slavery. Paradoxically, the productivity of slave-labour was lower than that of the small peasants they displaced. But with a huge supply of slaves from foreign wars of conquest, the low level of productivity of the individual slave was compensated for by the cheapness of labour power of a large number of slaves subjected to forced labour. The replacement of small peasant holdings by vast latifundia, worked by armies of slaves, gave rise to huge surpluses, as long as the supply of cheap slaves continued. Where slavery is the main mode of production, the very concept of labour becomes debased, identified in men’s minds with all things base and degraded. No wonder Aristotle could not stomach Anaxagoras’ theory that human intelligence depended on the hands!

This is not the place to analyse in detail the contradictions of the slave mode of production, which finally led to its demise. Suffice it to note that, despite the common attempt to compare the slave system with modern capitalism, in many ways it was the exact opposite. For example, the proletariat, which today, along with nature, produces all the wealth of society, in the period of the Roman empire was a parasitic class, which lived on the backs of the slaves. On the other hand, whereas the modern capitalist depends on the continual search for avenues of reinvestment, the possibilities for investment open to the Roman capitalist were limited by the nature of slave production itself.

The key to the expansion of the productive forces under present-day capitalism is the production of the means of production, the manufacture of new machines, which leads to a constant increase in capital. In Antiquity, however, the conditions for the development and application of machinery were lacking. The first of these is the existence of a large class of free labourers, who are compelled to sell their labour power to the owners of industry. There was no incentive to invent machines which could not be put to practical use. The relatively small class of craftsmen devoted themselves to the production of luxury articles for the gratification of the wealthy who, unlike the modern capitalists, having no productive outlet for their surpluses, devoted themselves to conspicuous consumption on a grand scale.

The entire system began to break down when the supply of cheap slave labour dried up, as the empire reached its limits. In the absence of a revolutionary overturn, the whole of society entered into a prolonged phase of decline and decay. The barbarian invasions did

not cause the collapse, but were an expression of the fact that the system of slavery had exhausted itself. The all-pervading sense of decay affected the outlook of every class. The feeling of weariness, of moral decadence, of disgust with a world that had outlived itself, finds its expression in the prevailing philosophies of the period—the words for two of them, cynicism and scepticism, have passed into the vocabulary of our own times, although with meanings completely different to the originals.

The cynics were followers of Diogenes of Antisthenes, a pupil of Socrates, who professed his open contempt for all existing morals and customs. His more famous disciple, also named Diogenes, from Sinope, carried this idea to the extreme of wishing to live "like a dog," hence the word "cynic'' (from the Greek word for a dog). It is said that he lived in a barrel. The idea, like that of present-day "drop-outs," was to reduce one's dependence on material things to a minimum. According to legend, when Alexander the Great offered him anything he wanted, he answered, "step out of my light." The whole idea, in contrast to the modern cynics, was to despise worldly things.

This idea of turning away from the world to seek spiritual salvation in oneself reflected the profound social and cultural crisis caused by the decline of the Greek city-states. Even Pythagoras and Plato, despite their idealist philosophy, did not actually renounce the world entirely. Both tried to influence it by trying to persuade rulers to put their philosophical views into practice. Both appealed to logic and reason. What we see here is something different. A complete renunciation of this world, and a total denial of the possibility of knowing anything.

While the Lyceum produced important scientific results, the Academy fell increasingly under the influence of scepticism. The sceptic philosophy, represented by Pyhrro, Sextus Empiricus and others, questioned the possibility of objective knowledge of reality. "We can never know anything, not even that we know nothing." This was their central tenet. It was, to some extent, the logical outcome of the method of deduction, which was held up by the idealists as the only means of arriving at the truth, not by reference to the real world of observation and experiment, but by deriving ideas from other ideas, axioms and "first principles," like those of Euclid in geometry, which are regarded as self-evident, and in no need of proof.

Sceptics like Timon denied the possibility of finding such principles. Everything had to be proved by something else, and that in turn by something else, and so on ad infinitum. And therefore, nothing can be known.

This marks a degeneration from objective idealism, which, for all its defects, was capable of reaching some important conclusions, to subjective idealism, the lowest, most primitive and sterile form of idealism. Ultimately, it leads to solipsism, the notion that only "I" exist. Everything depends on my subjective impressions. There is no objective truth. For example, I cannot assert that honey is sweet, only that it seems sweet to me. To most people this seems absurd. But it is basically no different to the views later put forward by Hume and Kant, which have been widely accepted by modern bourgeois philosophers and scientists. For example, the idea advanced by the sceptics that you cannot say anything for certain about the world, but only that certain things are "probable" is the philosophical basis for a false interpretation of the results of quantum

mechanics put forward in our own century by Werner Heisenberg and others and uncritically assimilated by many scientists.

Ideas like this do not drop from the clouds. They are the indirect and confused reflection in men's brains of an existing social reality. Scepticism in all its guises, including the modern ones, is the expression of a period in which a particular form of society has entered into irreversible decline, when the old ideals are breaking down, but the new ones have not yet asserted themselves. A general mood of uncertainty and malaise spreads through society, beginning with the educated layer, which feels it has lost its bearings. The most common expression of such moods is precisely scepticism, the insistence upon the relativity of all human knowledge, doubt, agnosticism. In the 18th century, the period of the revolutionary ascent of the bourgeoisie, the scepticism of Montaigne and others played a progressive role in criticising the religious dogmas of the theologians. However, the scepticism of Hume and Kant, which attempted to place a limit on the possibilities of human understanding, opened the door to the re-entry of religious faith. Not accidentally, it is this latter variant which has been taken over by modern bourgeois philosophy, in the guise of logical positivism.

The common feature of all these philosophies of the period of decline of slave society is the idea of a retreat from the world. It is the philosophy of despair. The world is seen as a vale of tears, from which it is necessary to escape, seeking individual salvation by various means. In the period of decline of the Roman empire, the philosophies of Epicureanism and Stoicism, dominant from the 1st century A.D. displayed the same tendency, although, as often happens, there was frequently a discrepancy between theory and practice. For example, Seneca, the stern moral philosopher of stoicism, who taught ethics to the emperor Nero, made a fortune out of lending money at exorbitant rates of interest, which provoked the rebellion of Bodicea against the Romans in Britain. This prophet of poverty left behind one of the biggest fortunes of the time—300 million sesterces.

In his masterly study of Antiquity, The Foundations of Christianity, Karl Kautsky describes the intellectual and moral climate in which these ideas took root:

"Epicurus called philosophy an activity that brings about a happy life by means of concepts and proofs. He believed this would be achieved by striving for pleasure, but only for rational lasting enjoyment, not for transitory sensual dissipations, which lead to the loss of health and wealth, and hence to pain.

"This was a philosophy very well suited to a class of exploiters that found no other employment for their wealth than to consume it. What they needed was a rational regulation of the life of enjoyment. But this theory gave no consolation to those, and their number kept growing, who had already suffered bodily, spiritual or financial shipwreck; nor to the poor and wretched, nor to the satiated, those who were revolted by pleasures. And not to those who still had an interest in the traditional forms of the community and still followed goals beyond their own personality, those patriots who grieved to see the decline of state and society, without being able to prevent it. For all these groups the pleasures of this world seemed stale and vain. They turned to the Stoic doctrine, which valued not pleasure but virtue as the highest good, as the only blessedness, and held external goods, health, wealth, etc., to be matters just as indifferent as external evils.

"This ended by leading many people to turn away from the world altogether, to despise life, even to long for death. Suicide became common in Imperial Rome; it actually became fashionable." (Kautsky, op. cit., p. 89.)

Here we stand on the threshold between philosophy and religion. A society which has exhausted itself economically, morally and intellectually finds its expression in a general mood of pessimism and despair. Logic and reason provide no answers, when the existing order of things is itself shot through with irrationality. Such circumstances are not conducive to the growth of scientific thought and bold philosophical generalisations. They are much more likely to produce an inward-looking tendency, reflecting social atomisation, mysticism and irrationality. From this world we can expect nothing, and even understand nothing. Far better to turn our backs on it, and prepare ourselves for a better life to come. In place of philosophy, we have religion, in place of reason, mysticism.

We already see this phenomenon in the period of decline of the Greek city-states when, in the words of Professor Gilbert Murray, "Astrology fell upon the Hellenic mind as a new disease falls upon some remote Pacific island people." (Quoted by Russell, p. 237.) The same phenomenon was multiplied a thousandfold in the long drawn-out decline of the Roman empire. The epidemic of Oriental religions and cults which afflicted Roman society at this time is well documented—not just Christianity and Judaism, but the cult of Mithras, the cult of Isis and Osiris, and a thousand other exotic sects proliferated at the expense of the official religion.

Many of these cults had similar ceremonies and rituals. The sacrament of Mithras included a sacred meal, in which consecrated bread and a chalice of wine were served to the faithful in anticipation of the future life. In fact, many elements of Christianity were taken over from other religions, and most of its doctrines from pagan philosophers. A special role was played by Plotinus (205-270), the Greek mystic and founder of the neo-Platonist school. Here we have the final decadence of classical idealism. The world is supposed to consist of the One, which is unknowable and inexpressible. We can only know it by mystical means, ecstatic communion, trances, and the like. This, in turn, is achieved through the mortification of the flesh, and the emancipation of our better self from the bondage of matter. Plotinus sets out from the idea of a Holy Trinity. Matter has no independent reality, but is the creation of the soul. The only question is, why the soul bothered to create such stuff in the first place. But one is not supposed to ask such questions here, only to accept it as a "mystery." All this was taken over, bag and baggage, by the early Christian apologists, who produced a theology which is the bastard child of Oriental religion and Greek idealism in the period of its decadence. Such was to become the staple diet of European culture for 2,000 years, with the most negative results for science.

The Struggle Against Religion

In the absence of a revolutionary alternative, the breakdown of slave society, produced a frightful collapse of culture, the effects of which lasted for centuries. In the period known as the Dark Ages, the scientific and artistic achievements of Antiquity were largely lost. The flame of learning was kept alight in Byzantium, Ireland and, above all, in the part of

Spain occupied by the Arabs. The rest of Europe remained sunk in barbarism for a long time.

Gradually, a new form of society emerged from the wreckage of the old, the feudal system, based on the exploitation of a peasantry who were no longer slaves, but were tied to the land, under the domination of temporal and spiritual lords. The pyramidal structure of society reflected this domination, with a rigid system of alleged duties and rights to one's "natural superiors." The fundamental duty, however, upon which everything else depended, was the duty of the serf to provide free labour service for his lord and master. This is what distinguishes this form of society from chattel slavery that went before it, and capitalism that followed it. The whole thing was sanctified by the Church, which wielded immense power, and was organised along similar hierarchical lines.

The static, unchanging character of the feudal mode of production, and the rigid social hierarchy that rested upon it, found an ideological expression in the fixed dogmas of the Church, which demanded unquestioning obedience, based on the official interpretation of the sacred texts. The earlier doctrines of the Christians, with their strong revolutionary and communist overtones were persecuted as heresy, and stamped out, once Christianity became accepted as the state religion. In place of reason, the Church Fathers preached blind faith, summed up in the celebrated phrase attributed to Tertullian, "Credo, quia absurdum est"—(I believe because it is absurd). Science was looked on as suspicious, a heritage of paganism. One of the last of the Greek mathematicians, Hypatia, was stoned to death by a mob led by a monk.

The heritage of classical Greek philosophy was lost, and was only partially revived in Western Europe in the 12th century. Such a situation was not conducive to the development of thought and science. "The conditions of feudal production reduced the demand for useful science to a minimum," writes J. D. Bernal. "It was not to increase again till trade and navigation created new needs in the later Middle Ages. Intellectual effort was to go in other directions and largely in the service of a radically new feature of civilisation—organised religious faiths." (Bernal, Science in History, p. 181.)

According to Forbes and Dijksterhuis:

"Generally speaking it may be said that during the first centuries of its existence Christianity was not conducive to scientific pursuits. Science was regarded with suspicion because of its pagan origin; moreover, the ideal prevailed that it was not advisable for the spiritual welfare of Christians to penetrate more deeply into the secrets of nature than was made possible by the Holy Scriptures and than was required to understand these." (Forbes and Dijksterhuis, A History of Science and Technology, Vol. 1, pp. 101-2.)

When the remnants of classical culture eventually reached Western Europe, it was in translations from the Arabic. The great energy shown by the Arabs in conquering North Africa and Spain right up to the Pyrenees was matched by their intelligent and flexible attitude to the culture of the conquered peoples, in marked contrast to the ignorant barbarism displayed by the Christians after the reconquest of Al-Andalus. For centuries, the Islamic universities in Spain, especially the one at C—rdoba, were the only real centres of learning in Europe, if we exclude Ireland, which, because of its remoteness,

remained outside the mainstream. The Arabs made great advances in a whole number of fields—mathematics, astronomy, geography, medicine, optics and chemistry, as well as important technological advances, shown by the vast irrigation schemes which were wantonly destroyed by the Christians. But it took hundreds of years for this knowledge to percolate through to Western Europe.

Because of the Church's monopoly of culture, all intellectual life had to be channelled through it. At the universities, where everything was taught in Latin, the curriculum was dominated by grammar, logic, rhetoric, arithmetic, astronomy and music. The high point was philosophy and theology, which were closely related. For centuries, philosophy was seen as the "handmaiden of theology." Science was reduced to a bare minimum: "Arithmetic was numeration; geometry the first three books of Euclid; astronomy hardly got past the calendar and how to compute the date of Easter; and the physics were very remote and Platonic." (Ibid., p. 218.) No interest was shown in scientific research and experiment.

Philosophy was reduced to an impoverished form of Platonic idealism, later replaced by a completely ossified and one-sided reading of Aristotle. In the early period, St. Augustine (354-430) based himself on Neo-Platonism to attack the pagan opponents of Christianity. Much later, the writings of St. Thomas Aquinas (1225-74) represent a falsification of Aristotelian philosophy to fit the needs of the Church in the conditions of feudal society, playing down the materialist elements and stressing the weak side of Aristotle, the "unmoved first mover" and so on. To this day, a variant of his philosophy (neo-Thomism) remains the basic position of the Roman Catholic Church.

However, even in such apparently infertile soil, the seeds of further development slowly began to germinate. The mediaeval scholastics, or Schoolmen, who endlessly debated questions of theology in order to provide their religious world outlook with some theoretical basis, eventually produced a number of thinkers who were beginning to draw materialist conclusions. Not by accident, the most prominent of them came from Britain, where the roots of empiricism have traditionally run deep.

In the later Middle Ages, the rise of the towns and trade saw the emergence of a new and vigorous element in the social equation. The rising class of wealthy merchants began to flex its muscles, demanding rights. The expansion of commerce, the opening up of new trade routes, the rise of a money economy, the creation of new needs and the means of satisfying them, the development of arts and crafts, the rise of a new national literature, all these things heralded the birth of a revolutionary force in society, the bourgeoisie, whose interests laid in breaking down the artificial feudal barriers which impeded its development, and also, to an ever-increasing extent, in developing and exploiting technical innovations.

The development of open-sea navigation, for example, demanded the production of new and better charts, based on accurate astronomical observations, and also of more advanced navigational instruments. The introduction of paper and printing had a revolutionary effect on the accessibility of ideas which had earlier been limited to a tiny minority of ecclesiastics. The production of literature written in the vernacular for the first time had the same effect, with the emergence of great recognisable national writers,

Boccaccio, Dante, Rabelais, Chaucer and finally, Luther. The introduction of gunpowder not only revolutionised warfare, and helped undermine the power of the nobles, but also gave a new impetus to the study of physics and chemistry.

First in Italy, then in Holland, Britain, Bohemia, Germany and France, the new class began to challenge the old order, which, after nearly a thousand years, had exhausted itself and entered a phase of decline. The endless wars and civil wars of the period bore witness to the impasse of feudalism. The Black Death, which decimated the population of Europe in the 14th century, hastened the dissolution of feudal relations on the land. The peasant "jacqueries" in France and the Peasant Rising in England were a warning of the approaching dissolution of the feudal order. To many people, it seemed that the end of the world was approaching. In fact, the sensation of impending doom which gave rise to phenomena like the flagellant sects, groups of religious fanatics, who travelled the country, whipping and otherwise inflicting pain on themselves, in anticipation of the impending Day of Wrath. This was merely a confused reflection in the popular imagination of the impending break-up of the existing social order.

The breakdown of a social system is anticipated by a crisis of the official morality and ideology, which increasingly enters into conflict with the changed social relations. A critical spirit arises among a layer of the intellectuals, always a barometer of the tensions building up within the depths of society. An ideology and morality which no longer reflects reality is one that has outlived itself, and is destined to be overthrown. The moral and ideological basis for the feudal system was the teaching of the Church. Any serious challenge to the existing order meant an assault on the Church, which defended its power and privileges with all the means at its disposal, including excommunication, torture and the stake. But no amount of repression can preserve an idea whose time has past.

The Middle Ages are usually depicted as a time of extreme religious devotion and piety. But that description certainly does not apply to the period under consideration. The Church, a wealthy and powerful institution which weighed heavily on the back of society, was widely discredited. "Of all the contradictions which religious life of the period presents," writes Huizinga, "perhaps the most insoluble is that of an avowed contempt of the clergy, a contempt seen as an undercurrent throughout the Middle Ages, side by side with the very great respect shown for the sanctity of the sacerdotal office...Hence it was that nobles, burghers and villeins had for a long time past been feeding their hatred with spiteful jests at the expense of the incontinent monk and the guzzling priest. Hatred is the right world to use in this context, for hatred it was, latent, but general and persistent. The people never wearied of hearing the vices of the clergy arraigned. A preacher who inveighed against the ecclesiastical state was sure of being applauded. As soon as a homilist broaches this subject, says Bernardino of Siena, his hearers forget all the rest; there is no more effective means of reviving attention when the congregation is dropping off to sleep, or suffering from heat or cold. Everybody instantly becomes attentive and cheerful." (J. Huizinga, The Waning of the Middle Ages, p. 172-3.)

The undercurrents of dissent were felt even within the Church itself, reflecting the pressures of society. Heretical movements like the Albirgenses were put down in blood. But new oppositional trends appeared, sometimes disguised in the garb of mysticism. A 19th century Italian historian relates:

"The same spirit of reformation which animated the Albigenses had spread throughout Europe: many Christians, disgusted with the corruption and vices of the clergy, or whose minds revolted against the violence on their reason exercised by the church, devoted themselves to a contemplative life, renounced all ambition and the pleasures of the world, and sought a new road to salvation in the alliance of faith with reason. They called themselves cathari or the purified; paterini, or the resigned." (Sismondi, A History of the Italian Republics, p. 66.)

The Dominican and Franciscan orders were founded in the early 12th century to combat heresies, anti-clericalism and new philosophical ideas. Sismondi says of Pope Innocent the Third: "He founded the two mendicant orders of Franciscans and Dominicans; new champions of the church, who were charged to repress all activity of mind, to combat growing intelligence, and to extirpate heresy. He confided to the Dominicans the fearful powers of the inquisition, which he instituted: he charged them to discover and pursue to destruction the new reformers, who, under the name of paterini, multiplied rapidly in Italy." (Ibid., p. 60.)

Violent repression of opposition of any kind was a constant feature of the conduct of the ecclesiastical authorities from the highest level, as the history of the papacy shows. Pope Urban the Sixth, when he could not get the support of his cardinals, resolved the problem by the simple expedient of accusing them of conspiracy against him. He had many cardinals put to the torture in his presence, while he calmly recited his rosary. Others he ordered to be put in sacks and drowned in the sea. The reforming monk Girolamo Savonarola, an Italian precursor of Luther, was tortured until he confessed all the crimes attributed to him, and burnt alive with two other monks. Examples can be multiplied at will.

The development of science was held back for hundreds of years by the stifling of thought by the spiritual police of the Church. The not inconsiderable intellectual energies of the Schoolmen were dissipated in endless and complicated debates on such subjects as the sex of angels. Nobody was permitted to go beyond the limits laid down by Church dogma, and those who attempted to do so laid themselves open to harsh reprisals.

It therefore called for great courage when the English scholastic Roger Bacon (c. 1214-92), went so far as to challenge the Schoolmen’s dogmatism and veneration of authority. Going against the spirit of the times, and anticipating the scientific method, he advocated the experimental study of nature. Given the fact that science had still not separated itself from alchemy and astrology, it is not surprising that elements of these were present in Bacon’s writings. Nor is it surprising that he was rewarded for his boldness by being dismissed from teaching at Oxford and confined to a monastery for his heretical views. In the circumstances, he was lucky.

The philosophical trend known as nominalism, which emerged at this time, stated that universal concepts are only names of individual objects. This reflected a move in the direction of materialism, as Engels explains:

"Materialism is the natural-born son of Great Britain. Already the British Schoolman Duns Scotus, asked, ‘whether it was impossible for matter to think?’

"In order to effect this miracle, he took refuge in God’s omnipotence, i.e., he made theology preach materialism. Moreover, he was a nominalist. Nominalism, the first form of materialism, is chiefly found among the English Schoolmen." (Engels, Anti-Dühring, p. 427.)

The nominalist trend was developed by another Englishman (though, to be exact, Duns Scotus, as his name implies, was born either in Scotland or in Northern Ireland) William of Occam (died 1349), the most important of the Schoolmen. Occam maintained that the existence of God and other religious dogmas could not be proved by reason, and were founded solely upon faith. This was a dangerous doctrine, since it would mean separating philosophy from religion, enabling it to develop separately, freed from the dead hand of the Church. Occam was excommunicated in 1328, but escaped from the Pope’s territory in Avignon, and fled to the protection of Louis, King of France, who was also excommunicated. Louis then appealed to a general Council, and the Pope found himself accused of heresy. It is said that when Occam met the Emperor he said to him: "Do you defend me with the sword, and I will defend you with the pen." At bottom, this was not an abstract debate about philosophy, but the reflection of a life and death struggle between the Church and Emperor, and between France, England and Germany.

While containing the germ of a correct materialist idea, the philosophy of nominalism was mistaken in assuming that general concepts ("universals") are only names. In fact, they reflect real qualities of objectively existing things, which, apart from their particular features, also embody within themselves elements of the general, which identify them as belonging to a specific genus or species. This denial of the general and insistence on particulars is a peculiar feature of the empirical cast of mind which has characterised the Anglo-Saxon philosophical tradition ever since. As a reaction against the sterile idealist doctrines of the mediaeval Church, it represented an important advance, a step in the direction of scientific experiment:

"It will not be surprising that thinkers entertaining nominalistic or related conceptions exerted a favourable influence on the study of science. Nominalism predisposed to attention for the experience of concrete things to be gained through the senses, whereas the opposite doctrine known as platonic realism (a confusing name, because it held that reality lay in ideas, so that it might also have been called idealism) always implied the temptation to aprioristic speculation." (Forbes and Dijksterhuis, op. cit., Vol. 1, p. 117.)

Nominalism is the germ of materialism, but a one-sided and superficial materialism which later led to a philosophical dead-end with Berkeley, Hume and the modern semantic philosophers. At the time, however, it represented a huge advance. Occam was the last of the great scholastics, but his approach encouraged a new generation of thinkers, like Nicholas of Oresme, his pupil, who investigated planetary theory. He anticipated Copernicus by considering the geocentric theory, which places the earth at the centre of the universe, and comparing it with the heliocentric theory, which states that the sun is at the centre, and concluding that either theory would serve to explain all the known facts, and that, therefore, it was impossible to choose between them. This apparently cautious conclusion was, in fact, quite a bold step, since it put a question mark over the orthodox position of the Church, and thereby challenged its whole world outlook.

The cosmology of the mediaeval Church formed an important part of its general world outlook. It was not a secondary issue. The picture of the universe was supposed to be a mirror-image of the world, with the same kind of static, unchanging character, the same rigid hierarchy. It was not derived from observation, but taken over from the cosmology of Aristotle and the Alexandrines, and accepted dogmatically. Bernal comments:

"The hierarchy of society was reproduced in the hierarchy of the universe itself; just as there was the pope, bishops, and archbishops, the emperor, kings, and nobles, so there was a celestial hierarchy of the nine choirs of angels: seraphim, cherubim, thrones; dominations, virtues, and powers; principalities, archangels, and angels (all fruits of the imagination of the pseudo Dionysius). Each of these had a definite function to perform in the running of the universe, and they were attached in due rank to the planetary spheres to keep them in appropriate motion. The lowest order of mere angels that belonged to the sphere of the moon had naturally most to do with the order of human beings just below them. In general there was a cosmic order, as social order, an order inside the human body, all representing states to which Nature tended to return when it was disturbed. There was a place for everything and everything knew its place." (Op. cit., p. 227.)

This view of the universe could not be challenged without calling into question the entire world-outlook of the Church, and the type of society it defended. The conflict around the ideas of Copernicus and Galileo were not abstract intellectual debates, but a life and death battle between opposing views of the world, which ultimately reflected a desperate struggle between two mutually exclusive social orders. The future of world history hinged upon the outcome.

Chapter Four
The Renaissance

"Then felt I like some watcher of the skies
When a new planet swims into his ken;
Or like stout Cortez when with eagle eyes
He star'd at the Pacific—and all his men
Look'd at each other with a wild surmise—
Silent, upon a peak in Darien. (John Keats)

"Eppur si muove."
"But it does move." (Galileo Galilei)

Modern science takes its starting point from the Renaissance, that marvellous period of spiritual and intellectual rebirth, which put and end to the thousand year reign of ignorance and superstition. Humanity once again looked to nature with eyes unblinkered by dogma. They rediscovered the wonders of classical Greek philosophy, directly translated from reliable versions which reached Italy after Constantinople was taken by the Turks. The materialist world outlook of the old Ionians and the atomists pointed science onto the right path.

This was a revolutionary period in every sense of the word. Luther not only started the Reformation in religion, but also reformed the German language. At the same time, the Peasants' War in Germany, with its communistic overtones, pointed the way to future class struggles. "The dictatorship of the Church over men's minds was shattered," wrote Engels, "it was directly cast off by the majority of the Germanic peoples, who adopted Protestantism, while among the Latins a cheerful spirit of free thought, taken over from the Arabs and nourished by the newly-discovered Greek philosophy, took root more and more and prepared the way for the materialism of the eighteenth century." (Engels, The Dialectics of Nature, p. 30.)

The discovery of America and the sea route to the East Indies opened up new horizons for trade and exploration. But even vaster horizons came into view in the field of the intellect. The old narrow one-sidedness became impossible. It was necessary to break down all the old barriers in order to get at the truth. As in all revolutionary epochs, at this time there was a burning desire to know.

The development of science is closely linked to the growth of technology, which, in turn, is connected to the development of the productive forces. Take astronomy. The cosmological speculations of the ancient Greeks were limited by the lack of telescopes which could aid their observations. In the year 137 A.D., observers had tabled the existence of 1,025 planetary bodies. By 1580, the number was exactly the same, and was arrived at using the same instrument—the naked eye.

Today's astronomers, using powerful radio telescopes, can observe a vast array of stars and galaxies. This fact has transformed astronomy. Unfortunately, the advances of technology have proceeded far more rapidly than the development of the ideas in the

minds of men and women. In many respects, the world outlook of some scientists in the last decade of the 20th century has more in common with that of the mediaeval Church than the heroes of the Renaissance whose struggles against philosophical obscurantism made modern science possible.

Anaximander and Anaxagoras held that the universe was infinite—it had no beginning and no end. Matter could not be created or destroyed. This idea found acceptance with many other philosophers of Antiquity, and was summed up by the famous aphorism—Ex nihilo nihil fit—out of nothing comes nothing. It is therefore futile to look for a beginning or a creation of the universe, because it has always existed.

For the Church, such a view was anathema, because it left the Creator out of the picture. In an infinite material world, there is no room for God, the Devil, the angels, heaven or hell. Therefore they seized avidly upon the weakest and most puerile of Plato's writings, the Timaeus, which is really a creation-myth. On the other hand, they had the Ptolomeic system of the cosmos, which, in addition, corresponded to the cosmological scheme of Aristotle, whose authority was absolute at the time. This was the picture of a closed universe. The earth stood at the centre, enclosed by seven crystal spheres, on which the sun, the moon and the planets traced perfect circular orbits round the earth. This concept seems strange to modern minds. But it actually was sufficient to explain many observable phenomena. In fact, from the standpoint of simple "common sense," it would seem that the sun goes round the earth and not vice-versa.

Despite this, the geocentric view was challenged even in Ptolomey's day. The alternative heliocentric theory was defended by Aristarchus of Samos (c. 310-230 B.C.), who put forward the complete hypothesis of Copernicus, that all planets, including the earth go round the sun in circles, and that the earth revolves on its axis every twenty four hours. This brilliant theory was discarded in favour of the Ptolomaic view, because it fitted in with the Church's outlook. The earth stood at the centre of the universe, and the Church stood at the centre of the world.

Copernicus, the great Polish astronomer (1473-1543), had travelled to Italy in his youth, and was infected with the new spirit of inquiry and free thinking abroad. He soon came to accept that the sun was at the centre of the universe, but kept his ideas to himself for fear of the reaction of the Church. Only on his death bed did he decide to publish his book, De Revolutionibus Orbium Coelestium (On the Revolutions of the Heavenly Bodies), which he dedicated to the Pope, in the hope of escaping censure. Temporarily, he succeeded. The book was not condemned until Galileo's time, when the Inquisition and the Jesuits, the shock-troops of the Counter Reformation were in full swing.

Tycho Brache, the Danish astronomer (1546-1601), took an intermediate position, arguing that, while the sun and moon go round the earth, the planets go round the sun. Far more important was the role of the German, Johannes Kepler (1571-1630), who made use of Brache's calculations to correct some inaccuracies in Copernicus' model, and put forward his three laws: that planets move, not in circles, but in ellipses; that the line joining a planet to the sun sweeps out equal areas in equal times, and that the square of the period of revolution of a planet is proportional to the cube of its average distance from the sun.

These propositions struck a heavy blow against the orthodox positions of the Church. The planets had to move in circles because the circle was the perfect form. That had been the accepted view of all idealists since Pythagoras. Kepler's first law now meant that they moved in an ellipse—a far from perfect form! His second law was still more monstrous from the "official" point of view. Instead of a nice smooth movement, the speed of the planets in orbit varied, being faster when nearer the sun, and slower when furthest away from it. How could this be compatible with the notion of the divine harmony of the universe?

The point is that, whereas Kepler's theories were based upon Brache's scrupulous observations, the position of the Church was based on an idealist theory which was simply assumed to be true. To the modern observer, the position of the opponents of Copernicus and Kepler seem absurd. Yet echoes of this idealist method are still to be heard today, when serious physicists and mathematicians defend their equations, not on their correspondence with the known facts of observation, but on their alleged aesthetic value. This is a question we shall return to.

Galileo

The greatest Renaissance scientist of them all was probably Galileo (1564-1642). Having already made great discoveries in the field of projectiles and falling objects, Galileo, a convinced supporter of the Copernican position, was the first astronomer to make use of the recently invented telescope to investigate the heavens. His observations left not a single stone standing of the old view of the universe. The moon, far from being a perfect sphere, was an irregular surface, with mountains and seas. Venus had phases like the sun, and, most important of all, Jupiter had four moons. The Church maintained that there were seven planets, because seven was a mystical number. How could there be eleven? The image of the professor refusing to look through Galileo's telescope has passed into the folklore of scientific history, summing up the clash of two antagonistic world outlooks.

In recent years, attempts have been made to minimise the Church's persecution of science. Pope John Paul ll launched an investigation into the "Galileo Affair." That enquiry, published in 1992, revealed "grave reciprocal misunderstandings," and errors on both sides. But it all happened in "a cultural context very different from ours." In October 1993, the Pope delivered a message to a Conference at Copernicus's alma mater, the University of Ferrara, commemorating the 450th anniversary of the publication of the Polish astronomer's book, De Revolutionibus Orbium Coelestium. He was, says the Pope, a man both of science and of faith. In fact, the only reason Copernicus escaped persecution by the Church was to make sure his book saw the light of day when he was in a very safe place—the cemetery!

Galileo was put on trial twice by the Inquisition, once in private (1616) and once in public (1633). The second time he was forced to recant his views. He promised never again to claim that the earth goes round the sun or rotates on its axis. In this way, the Church silenced the greatest scientist of the age, and in the process killed off science in Italy for a long time. A worse fate befell others. Giordano Bruno (1548-1600) was burnt at the stake in Rome after eight years imprisonment.

Bruno was an uncompromising materialist. He had been influenced by Nicholas of Cusa, who argued that the universe has no beginning or end in space or time. Bruno's materialism was coloured by a kind of pantheism, the idea that God is everywhere and nowhere, that is, that God and nature are one and the same. In a concept similar to that of the old Ionian hylozoism, he held that matter was an active, self-moving substance, and that man and his consciousness was part of nature, which was a single whole. Following in the footsteps of Nicholas of Cusa, he argued that the universe is infinite. He deduced that the universe consisted of an infinite number of worlds, some of them possibly inhabited. It is easy to see why the Church saw these startlingly modern ideas as subversive. Bruno did not shrink from paying for them with his life.

The Roman Church did not have a monopoly of the persecution of new ideas. The Protestant Luther denounced Copernicus as "an upstart astrologer who strove to show that the earth revolves, not the heavens or the firmament, the sun or the moon." As Engels observes, "At that time, natural science also developed in the midst of the general revolution and was itself thoroughly revolutionary; it had indeed to win in struggle its right of existence. Side by side with the great Italians from whom modern philosophy dates, it provided its martyrs for the stake and the dungeons of the Inquisition. And it is characteristic that Protestants outdid Catholics in persecuting the free investigation of nature. Calvin had Servetus burnt at the stake when the latter was on the point of discovering the circulation of the blood, and indeed he kept him roasting alive during two hours; for the Inquisition at least it sufficed to have Giordano Bruno simply burnt alive." (Engels, Dialectics of Nature, p. 32.)

Despite all reverses, the new mode of thinking, steadily gained ground, until, by the late 17th century, it had won a decisive victory. The same scientists, who, in the name of orthodoxy, had condemned the ideas of Galileo, in practice quietly dropped the discredited Ptolomeic cosmology. The discovery of the circulation of the blood by William Harvey (1578-1657) revolutionised the study of the human body, destroying the old myths. The discoveries of science, more than the logical disputation of the philosophers, made the old views untenable.

Although the traditional methods of the Schoolmen remained in place for a long time, they were increasingly seen as out of step with reality. The growth of science proceeded on other lines, and with other methods—observation and experiment. Once again, England was in the vanguard in advocating the empirical method. The most prominent proponent of this was Francis Bacon (1561-1626), who was for a time Lord Chancellor of England under King James I, until he lost his position as a result of being too successful in enriching himself by accepting gifts from litigants. Thereafter he put his talents to better use writing books.

Bacon's writings are full of sound, practical common sense, and are materialist in the English, that is empirical, sense of the word. The general spirit of his works is that of a good natured and witty man of the world. Unlike Sir Thomas More, Bacon was not the stuff that martyrs are made of. He accepts the orthodox religion, just because he attaches little importance to general principles. But religion plays no role in his philosophy, which is inspired by the idea of developing learning as a means of increasing man's power over nature.

He reacted against the dogmatism of the Schoolmen, with their "unwholesome and vermiculate" disputes which end in "monstrous altercations and barking questions." The only times he displays real indignation is when he touches on this subject:

"This kind of degenerate learning did chiefly reign amongst the Schoolmen: who having sharp and strong wits, and abundance of leisure, and small variety of reading, but their wits being shut up in the cells of a few authors (chiefly Aristotle their dictator) as their persons were shut up in the cells of monasteries and colleges, and knowing little history, either of nature or time, did out of no great quantity of matter and infinite agitation of wit spin out unto those laborious webs of learning which are extant in their books. For the wit and mind of man, if it work upon matter, which is the contemplation of the creatures of God, worketh according to the stuff, and is limited thereby; but if it work upon itself, as the spider worketh his web, then it is endless, and brings forth indeed cobwebs of learning, admirable for the fineness of thread and work, but of no substance or profit." (F. Bacon, The Advancement of Learning, p. 26.)

Here we have the healthy reaction against the sterile method of idealism which, turning its back upon the real world, spins fancies out of its own head and takes them for the truth just because they correspond to a set of preconceived prejudices which are taken as axioms. Instead of this, Bacon urges us to "imitate nature, which doth nothing in vain." (Ibid., p. 201.) Significantly, he prefers Democritus the atomist to Plato and Aristotle. Speaking ironically of the Supreme Craftsman who was supposed to have created the world from nothing, he asks a pertinent question:

"For if that great Workmaster had been of a human disposition, he would have cast the stars into some pleasant and beautiful works and orders, like the frets in the roofs of houses; whereas one can scarce find a posture in square, or triangle, or straight line, amongst such an infinite number; so differing a harmony there is between the spirit of man and the spirit of nature." (Ibid., p. 133.)

This is a very important point, and one that is too often forgotten by scientists and mathematicians, who imagine that their equations represent the ultimate truth. In nature there are no such perfect forms, no triangles, no circles, no planes, only real material objects and processes, of which these ideal representations are only rough approximations. Bacon understood this very well, when he wrote:

"Hence it cometh, that the mathematicians cannot satisfy themselves except they reduce the motions of the celestial bodies to perfect circles, rejecting spiral lines, and labouring to be discharged of eccentrics. Hence it cometh, that whereas there are many things in nature as it were monodica, sui juris; yet the cogitations of man do feign unto them relatives, parallels, and conjugates, whereas no such thing is." (Ibid.)

The abstract generalisations of science, including those of mathematics, are only of use insofar as they correspond to the real world, and can be applied to it. Even the most fruitful and ingenious generalisation will necessarily only reflect reality in an imperfect and one-sided way. The problem arises when idealists make exaggerated claims for theories which they elevate to absolute principles to which reality is expected to conform.

The most recent trend in science, chaos theory, is returning, on a much higher level, to the fruitful line of argument of Bacon and the materialists of the Renaissance, who, in turn, represented the rediscovery of a much older tradition, that of the Greek materialism of the Ionic and atomic schools. Bacon evolved his own materialist conception of nature, based on the idea that matter was made up of particles endowed with manifold properties, one of which was motion, which he did not limit to mechanical motion, but advanced the brilliant hypothesis that heat itself is a form of motion. Motion is here regarded, not merely as an external impulse, as a mechanical force, but as an inherent quality of matter, a kind of vital spirit or inner tension. Marx likens it to the term used by the German philosopher Jakob Böhme, "Qual," which cannot be easily translated, but which signifies extreme inner tension, or "torment," as with a living thing. Thus the primary forms of matter are endowed with movement and energy, almost like a living force. Nowadays we would use the word energy. Compared with the lifeless, wooden mechanistic conceptions of the following century, this view of matter is strikingly modern, and comes close to the position of dialectical materialism.

This last observation brings us close to the heart of the matter. The real significance of Bacon's philosophy was that it pointed the way forward. Although incomplete in itself, it contained the seeds of future development, as Marx explains in The Holy Family:

"In Bacon, its first creator, materialism still holds back within itself in a na•ve way the germs of a many-sided development. On the one hand, matter, surrounded by a sensuous, poetic glamour, seems to attract man's whole entity by winning smiles. On the other, the aphoristically formulated doctrine pullulates with inconsistencies imported from theology." (MECW, Vol. 4, p. 128.)

Bacon's theory of knowledge was strictly empirical. Like Duns Scotus, he emphatically denied the existence of "universals." He developed the method of reasoning known as induction, which is already present in the works of Aristotle. This is a way of studying things experimentally, in which we proceed from a series of single facts to general propositions. As an antidote to the arid idealism of the Schoolmen, this was an important advance, but it had serious limitations, which later became an obstacle to the development of thought. Here we see the beginning of that peculiarly Anglo-Saxon aversion to theory, the tendency towards narrow empiricism, the slavish worship of the "facts," and a stubborn refusal to accept generalisations which has dominated educated thought in Britain and, by extension, the United States, ever since.

The limitations of a strictly inductive method are self-evident. No matter how many facts are examined, it only takes a single exception to undermine whatever general conclusion we have drawn from them. If we have seen a thousand white swans, and draw the conclusion that all swans are white, and then see a black swan, our conclusion no longer holds good. These conclusions are hypothetical, demanding further proof. Induction, in the last analysis, is the basis of all knowledge, since all we know is ultimately derived from observation of the objective world and experience. Over a long period of observation, combined with practical activity which enables us to test the correctness or otherwise of our ideas, we discover a series of essential connections between phenomena, which show that they possess common features, and belong to a particular genus or species.

The generalisations arrived at over a lengthy period of human development, some of which are considered as axioms, play an important role in the development of thought and cannot be so easily dispensed with. The thought-forms of traditional logic play an important role, establishing elementary rules for avoiding absurd contradictions and following an internally consistent line of argument. Dialectical materialism does not regard induction and deduction as mutually incompatible, but as different aspects of the dialectical process of cognition, which are inseparably connected, and condition one another. The process of human cognition proceeds from the particular to the universal, but also from the universal to the particular. It is therefore incorrect and one-sided to counterpose one to the other.

Despite claims made to the contrary, it is impossible to proceed from the "facts" without any preconceptions. Such supposed objectivity has never existed and will never exist. In approaching the facts, we bring our own conceptions and categories with us. These can either be conscious, or unconscious. But they are always present. Those who imagine that they can get along quite happily without a philosophy, as is the case with many scientists, merely repeat unconsciously the existing "official" philosophy of the day and the current prejudices of the society in which they live. It is therefore indispensable that scientists, and thinking people in general should strive to work out a consistent way of looking at the world, a coherent philosophy which can serve as an adequate tool for analysing things and processes.

In the Introduction to The Philosophy of History, Hegel rightly ridicules those historians (all too common in Britain) who pretend to limit themselves to the facts, presenting a spurious facade of "academic objectivity," while giving free reign to their prejudices:

"We must proceed historically—empirically. Among other precautions we must take care not to be misled by professed historians who...are chargeable with the very procedure of which they accuse the Philosopher—introducing a priori inventions of their own into the records of the Past...We might then announce it as the first condition to be observed, that we should faithfully adopt all that is historical. But in such general expressions themselves, as ‘faithfully’ and ‘adopt,’ lies the ambiguity. Even the ordinary, the ‘impartial’ historiographer, who believes and professes that he maintains a simply receptive attitude; surrendering himself only to the data supplied him—is by no means passive as regard the exercise of his thinking powers. He brings his categories with him, and sees the phenomena presented to his mental vision, exclusively through these media. And, especially in all that pretends to the name of science it is indispensable that Reason should not sleep—that reflection should be in full play. To him who looks upon the world rationally, the world in its turn presents a rational aspect. The relation is mutual. But the various exercises of reflection—the different points of view—the modes of deciding the simple question of the relative importance of events (the first category that occupies the attention of the historian), do not belong to this place." (Hegel, The Philosophy of History, p. 10.)

Bertrand Russell, whose views are diametrically opposed to dialectical materialism, makes a valid criticism of the limitations of empiricism, which follows in the same line as Hegel’s remarks:

"As a rule, the framing of hypotheses is the most difficult part of scientific work, and the part where great ability is indispensable. So far, no method has been found which would make it possible to invent hypotheses by rule. Usually some hypothesis is a necessary preliminary to the collection of facts, since the selection of facts demands some way of determining relevance. Without something of this kind, the mere multiplicity of facts is baffling." (Op. cit., p. 529.)

Thus, the Baconian school of thought exercised a contradictory influence upon subsequent developments. On the one hand, by stressing the need for observation and experiment, it gave a stimulus to scientific investigation. On the other hand, it gave rise to the narrow empiricist outlook that has had a negative effect on the development of philosophical thought above all in Britain. In The Dialectics of Nature, Engels points out the paradox that this same empirical school, which imagined that it had disposed of metaphysics once and for all, actually ended up accepting all kinds of mystical ideas, and that this trend "which, exalting mere experience, treats thought with sovereign disdain...really has gone to the furthest extreme in emptiness of thought." (Engels, The Dialectics of Nature, p. 68.)

The immediate battle against religion had been won. Science was set free from the bonds of theology which had kept it in thrall for so long. This was the prior condition for the giant leap forward of the next period, when more was achieved in a century than in the whole of the previous thousand years. But the new world outlook was still insufficiently developed, characterised in general by a shallow and naive empiricism, that was far from sufficient to get rid of religion and idealism once and for all. "The emancipation of natural science from theology," wrote Engels, "dates from this, although the fighting out of particular mutual claims has dragged on down to our day and in many minds is still far from completion." (Ibid., p. 32.) One hundred years later, despite the undreamed-of advances of science and human knowledge, the war has still not been decisively won.

The Age of Immutability

During the Renaissance, as in ancient times, philosophy and science, which were mainly the same thing, looked upon nature as a single, interdependent whole. A series of brilliant hypotheses were advanced as to the nature of the universe, but could not be verified or developed further because of the existing state of technology and production. Only with the birth of capitalism, and particularly with the beginnings of the industrial revolution did it become possible to investigate in detail the workings of nature in their different manifestations. This profoundly altered the way men and women looked at the world:

"Genuine natural science dates from the second half of the fifteenth century, and from then on it has advanced with ever increasing rapidity. The analysis of nature into its individual parts, the division of the different natural processes and objects into definite classes, the study of the internal anatomy of organic bodies in their manifold forms—these were the fundamental conditions for the gigantic strides in our knowledge of nature that have been made during the last four hundred years. But this has bequeathed us the habit of observing natural objects and processes in isolation, detached from the general context; of observing them not in their motion, but in their state of rest; not as essentially variable elements, but as constant ones; not in their life, but in their death. And when this

way of looking at things was transferred by Bacon and Locke from natural science to philosophy, it begot the narrow, metaphysical mode of thought peculiar to the last centuries." (Engels, Anti-Dühring, p. 25.)

In the writings of Thomas Hobbes (1588-1679) the materialism of Bacon is developed in a more systematic way. Hobbes lived in a period of revolution. A convinced monarchist, he experienced at first hand the storm and stress of the English Civil War. The impending victory of Parliament forced him to flee to France, where he met and clashed with Descartes. His royalist convictions should have endeared him to the monarchist exiles in whose midst he lived (for a while he taught mathematics to prince Charles). But, like Hegel, whose conservative politics did not prevent his philosophy from attracting the suspicions of the authorities, Hobbes ideas proved too radical for his contemporaries. The materialist tone of his Leviathan, which appeared in 1651, provoked the wrath of the Church and government of France, while his theories of society offended the English exiles by their rationalism. By a supreme irony, Hobbes was forced to flee to England, where he was welcomed by Cromwell, on condition he abstained from political activity.

The Restoration of the monarchy after the death of Cromwell led to the imposition of severe restrictions on intellectual freedom. Baconians were expelled from Oxford and Cambridge, effectively undermining them as centres of science. Under the Licensing Acts (1662-95) an iron censorship was re-imposed. Hobbes was afraid that the Bishops would attempt to have him burnt. He was suspected of atheism, and even mentioned in a parliamentary report on the subject. His book Behemoth was withheld from publication until 1679. After that, he could get nothing of importance published in England for fear of ecclesiastical repression.

It is not hard to see why he attracted such a reputation. Right from the first page of Leviathan, he proclaims the materialist doctrine in the most intransigent spirit. For him, there is absolutely nothing in the human mind which does not originate in the senses:

"Concerning the Thoughts of man, I will consider them first Singly, and afterwards in Trayne, or dependence upon one another. Singly, they are every one a Representation or Apparence, of some quality, or other Accident of a body without us; which is commonly called an Object. Which Object worketh on the Eyes, Eares, and other parts of mans body; and by diversity of working, produceth diversity of Apparences.

"The Originall of them all, is that which we call SENSE; (For there is no conception in a mans mind, which hath not at first, totally, or by parts, been begotten upon the organs of Sense.) The rest are derived of that originall." (Leviathan, p. 3.)

Elsewhere, he comes close to attributing the origins of religion to primitive superstitions arising from phenomena such as dreams, although, for obvious reasons, he limits the application of this idea to non-Christian religions!

"From this ignorance of how to distinguish Dreams, and other strong Fancies, from Vision and Sense, did arise the greatest part of the Religion of the Gentiles in time past, that worshipped Satyres, Fawnes, Nymphs, and the like; and now adayes the opinion that rude people have of Fayries, Ghosts, and Goblins; and of the power of Witches." (Ibid.,

p.7.)

Following in Bacon's footsteps, Hobbes appeals directly to nature, as the source of all knowledge:

"Nature it selfe cannot erre: and as men abound in copiousness of language; so they become more wise, or more mad than ordinary. Nor is it possible without Letters for any man to become either excellently wise, or (unless his memory be hurt by disease, or ill constitution of organs) excellently foolish. For words are wise mens counters, they do but reckon by them: but they are the mony of fooles, that value them by the authority of an Aristotle, a Cicero, or a Thomas, or any other Doctor whatsoever, if but a man." (Ibid., p. 15-6.)

And, like Bacon and Duns Scotus, he follows in the tradition of nominalism, denying the existence of universals, except in language:

"Of names, some are Proper, and singular to one onely thing; as Peter John, This man, this Tree: and some are Common to many things; as Man, Horse, Tree; every of which though but one Name, is nevertheless the name of divers particular things; in respect of all which together, it is called as Universall; there being nothing in the world Universall but Names; for the things named, are every one of them Individuall and Singular." (Ibid., p. 13.)

In comparison to Bacon, the method of Hobbes is much more worked-out, but at the same time becomes increasingly more one-sided, rigid, soulless, in a word, mechanistic. This was not accidental, since the science which was advancing most rapidly at the time was mechanics. Increasingly, the entire workings of the world came to be seen in terms borrowed from mechanics. Thus, for Hobbes, society was like a human body, which, in turn, was just a machine:

"Nature (the Art whereby God hath made and governes the World) is by the Art of man, as in many other things, so in this also imitated, that it can make an Artificial Animal. For seeing life is but a motion of Limbs, the begining whereof is in some principall part within; why may we not say, that all Automata (Engines that move themselves by springs and wheeles as doth a watch) have an artificiall life? For what is the Heart, but a Spring; and the Nerves, but so many Strings; and the Joynts, but so many Wheeles, giving motion to the whole Body, such as was intended by the Artificer? Art goes yet further, imitating that Rationall and most excellent worke of Nature, Man. For by Art is created that great LEVIATHAN called a COMMON-WEALTH, or STATE, (in latine CIVITAS) which is but an Artificiall Man." (Ibid., p. 1.)

Marx sums up Hobbes' contribution in the following passage from The Holy Family:

"Hobbes, as Bacon's continuator, argues thus: if all human knowledge is furnished by the senses, then our concepts, notions, and ideas are but the phantoms of the real world, more or less divested of its sensual form. Philosophy can but give names to these phantoms. One name may be applied to more than one of them. There may even be names of names. But it would imply a contradiction if, on the one hand, we maintained that all ideas had their origin in the world of sensation, and, on the other, that a word was more than a

word; that besides the beings known to us by our senses, beings which are one and all individuals, there existed also beings of a general, not individual, nature. An unbodily substance is the same absurdity as an unbodily body. Body, being, substance, are but different terms for the same reality. It is impossible to separate thought from matter that thinks. This matter is the substratum of all changes going on in the world. The word infinite is meaningless, unless it states that our mind is capable of performing an endless process of addition. Only material things being perceptible, knowable to us, we cannot know anything about the existence of God. My own existence alone is certain. Every human passion is a mechanical movement which has a beginning and an end. The objects of impulse are what we call good. Man is subject to the same laws as nature. Power and freedom are identical." (MECW, Vol. 4, p. 128-9.)

This mechanistic view of the world, in a sense, represents a step back in relation to Bacon. "Knowledge based upon the senses loses its poetic blossom," writes Marx, "it passes into the the abstract experience of the geometrician. Physical motion is sacrificed to mechanical or mathematical motion; geometry is proclaimed as the queen of sciences. Materialism takes to misanthropy. If it is to overcome its opponent, misanthropic, fleshless spiritualism, and that on the latter's own ground, materialism has to chastise its own flesh and turn ascetic. Thus it passes into an intellectual entity; but thus, too, it involves all the consistency, regardless of consequences, characteristic of the intellect." (MECW, Vol. 4, p. 128.) Yet this type of mechanical materialism was to predominate for the next century and a half in Britain and France.

John Locke (1632-1704) continued in the same direction as Hobbes, declaring that experience is the sole source of ideas. To him belongs the celebrated maxim nihil est in intellectu, quod non prius fuit in sensu—nothing is in the intellect which was not first in sense. It was Locke, with his Essay on the Human Understanding, who supplied the proof for Bacon's fundamental principle, that the origin of all human knowledge and ideas was the material world given to us in sense-perception. He is the philosopher of sound common sense, who "said indirectly that there cannot be any philosophy at variance with healthy human senses and the reason based on them." (MECW, Vol. 4, p. 129.) "Reason," he said, "must be our judge and guide in everything." Locke's work was translated into French, and inspired Condillac and others to launch the French school of materialist philosophy, which prepared the ground intellectually for the Revolution of 1789-93.

The Advance of Science

The period from the end of the seventeenth and beginning of the eighteenth centuries saw a complete transformation of the world of science rooted in the conquests of the previous period. In England, the victory of the bourgeoisie in the Civil War, and the subsequent compromise of a constitutional monarchy after 1688, provided relatively freer conditions for the development of scientific research and investigation. At the same time, the growth of trade and, increasingly, manufacture, created a need for more advanced technology and the capital necessary to pay for it. It was a period of unprecedented innovation and scientific advance.

Improvements in optics made possible the invention of the microscope. In France, Gassendi resurrected the atomic theories of Democritus and Epicurus. In Germany, Von

Guericke invented the air-pump. Robert Boyle made significant progress in chemistry. The discoveries of Copernicus, Tycho Brache, Kepler, Galileo and Huygens prepared the ground for Newton's revolution in astronomy, which were made necessary by the demand for more accurate navigation. The predominant method of science at the time was mechanistic: that is, that natural phenomena were to be interpreted in terms of form, size, position, arrangement, and motion of corpuscles, and their behaviour was to be explained exclusively in terms of contact with other particles.

The chief exponent of the new science was Sir Isaac Newton (1643-1727). Newton, who became President of the Royal Society in 1703, exercised a colossal influence, not just in science, but in philosophy and the general mode of thinking of the period in which he lived and later. The poet Alexander Pope sums up the adulatory attitude of contemporary Englishmen with his verse:

"Nature and Nature's laws lay hid in night:
God said 'Let Newton be!' and all was light."

Newton was born on Christmas day 1642, the year when Galileo died and the Civil War broke out between Charles I and Parliament. In 1687, he published his famous Principia Mathematica, which set forth three laws of motion—the law of inertia, law of proportionality of force and velocity, law of equality of action and counteraction, from which the basic principles of classical physics and mechanics were deduced. Here he set out and proved his theory of universal gravitation. This marks the definitive break with the old Aristotelean-Ptolomaic world-picture. Instead of celestial spheres operated by angels, Newton put forward a scheme of a universe functioning according to the laws of mechanics without the need for any divine intervention whatsoever, except for an initial impulse needed to set the whole thing in motion.

A typical product of the English empirical school, Newton was not much bothered about this, preferring to ask no questions about the role of the Almighty in his mechanical universe. For their part, the religious Establishment, personified by Bishop Sprat, bowing to the inevitable, advocated a compromise with science, much like the compromise between King William and Parliament, which held in place for about a century, until it was overthrown by Darwin's discoveries. The demands of capitalism ensured that science was left in peace to get on with the job.

Like the great thinkers of the Renaissance, the scientists of Newton's age were mostly men with a broad vision of science. Newton himself was not only an astronomer, but also a mathematician, optician and mechanic, and even a chemist. His contemporary and friend, Robert Hook, was not only the greatest experimental physicist before Faraday, but was also a chemist, mathematician, biologist and inventor, who shares with Papin the credit of preparing the way to the steam engine.

Invention of Calculus

The discovery of the infinitesimal calculus, which revolutionised mathematics, has been variously ascribed to Newton and Leibniz. It is possible that both came to the same conclusion independently. In his Method of Fluxions, Newton sets out from the

conception of a line as a "flowing quantity" (the "fluent"), and the velocity by which the line "flows" is described as its fluxion. Newton refers to a "moment" as an infinitely small length by which the fluent increased in an infinitely small time. This represented a complete break with the traditional method of mathematics, which totally excluded the concept of infinity and infinitesimals, which were not supposed to exist. The colossal advantage of this method was that it allowed mathematics for the first time to deal with motion. Indeed, Newton refers to it as the "mathematics of motion and growth." It was this instrument that permitted him to formulate the laws of planetary motion discovered by Kepler as general laws of motion and matter.

The discovery of the infinitesimal calculus was fundamental for the whole development of science. Yet it involves a contradiction which immediately caused a controversy, which lasted a long time. The first detractor of calculus was none other than Bishop Berkeley, who objected to the use of infinitesimally small quantities. This, he argued, was in contradiction to logic, and therefore unacceptable. "What are these fluxions?" he asked. "The velocities of evanescent increments. And what are these same evanescent increments? They are neither finite quantities, nor quantities infinitely small, nor yet nothing. May we not call them the ghosts of departed quantities?" (Quoted by Hooper, op. cit., p. 322.)

Here again, we see the fundamental limitation of the method of formal logic. Its basic premise is the elimination of contradiction. Yet motion is a contradiction—that of being and not being in the same place at the same time. In the first volume of his Science of Logic, Hegel deals in detail with the differential and integral calculus, and shows that it deals with magnitudes that are in the process of disappearing, neither before, when they are finite magnitudes, nor after, when they are nothing, but in a state which is and is not. This is in clear contradiction to the laws of formal logic, and hence provoked the indignant assaults of orthodox mathematicians and logicians. Despite all objections, the new mathematics achieved brilliant results in solving problems which could not be solved by the traditional methods. Yet when Newton published his Principia, he felt obliged to recast it in the form of classical Greek geometry, so as to cover up the fact that he had used the new method in all his calculations.

Newton also advanced the theory that light was composed of particles, tiny corpuscles projected through space by luminous bodies. In the early 19th century, this theory was abandoned in favour of Huygen’s wave theory, which was linked to the idea of the "ether," a hypothetical weightless, invisible medium, which, rather like the "dark matter" of modern astronomers, could not be detected by our senses, but which supposedly permeated space and filled the gaps between the air and other matter.

This theory seemed to explain all the known phenomena of light until 1900, when Max Planck put forward the idea that light was transmitted in small packets of energy or "quanta." Thus, the old Newtonian particle theory was revived, but with a striking difference. It was discovered that sub atomic particles behave both like waves and particles. Such a contradictory and "illogical" concept shocked the formal logicians as much as the differential and integral calculus had done. Eventually, they were compelled reluctantly to accept it, purely because, as with the calculus, the theory was backed up by practical results. But at every decisive turn, we see the same clash between the real

advances of science and the obstacles placed in its way by outmoded ways of thinking.

The revolutionary contribution of Newton to science is not in doubt. Yet his legacy was not an unmixed blessing. The uncritical adulation which he received in his lifetime in England obscured the important role of his contemporaries, like Hooke, who anticipated his Principia by seven years, though without the necessary mathematical backing, and Leibniz, the German philosopher who was probably the real discoverer of the calculus. Several of his most important theories were in fact put forward much earlier by Galileo and Kepler. His major role was to systematise and sum up the discoveries of the past period, and give them a general form, backed up by mathematical calculations.

On the negative side, Newton's enormous authority gave rise to a new orthodoxy that was to inhibit scientific thinking for a long time. "His abilities were so great," writes Bernal, "his, system so perfect, that they positively discouraged scientific advance for the next century, or allowed it only in the regions he had not touched." (Bernal, op. cit., p. 343.) The limitations of the English school of empiricism was summed up in his celebrated phrase: hypothesis non fingo—I make no hypotheses. This slogan became the battle cry of empiricism, yet bore absolutely no relation to the actual method of science, including that of Newton, who, for example, in the field of optics, made "numerous conjectures as to the physical causes of optical and other phenomena and even partly propounding them as facts. Thus, in his explanation of what were afterwards called Newton's rings, he treated the alternate fits of easy transmission and easy reflection along a ray of light as experimentally established facts, which he then made use of." (Forbes and Dijksterhaus, op. cit., Vol. 1, p. 247.)

The advances of science were enormous. Yet the general world-view bequeathed by the period was conservative. The static and mechanical outlook coloured mens' minds for generations, as Engels points out:

"But what especially characterises this period is the elaboration of a peculiar general outlook, the central point of which is the view of the absolute immutability of nature. In whatever way nature itself might have come into being, once present it remained as it was as long as it continued to exist. The planets and their satellites, once set in motion by the mysterious 'first impulse,' circled on and on in their predestined ellipses for all eternity, or at any rate until the end of all things. The stars remained for ever fixed and immovable in their places, keeping one another therein by 'universal gravitation.' The earth had remained the same without alteration from all eternity or, alternatively, from the first day of its creation. The 'five continents' of the present day had always existed, and they had always had the same mountains, valleys, and rivers, the same climate, and the same flora and fauna, except in so far as change or transplantation had taken place at the hand of man. The species of plants and animals had been established once for all when they came into existence; like continually produced like, and it was already a good deal for Linnaeus to have conceded that possibly here and there new species could have arisen by crossing. In contrast to the history of mankind, which develops in time, there was ascribed to the history of nature only an unfolding in space. All change, all development in nature, was denied. Natural science, so revolutionary at the outset, suddenly found itself confronted by an out-and-out conservative nature, in which even today everything was as it had been from the beginning and in which—to the end of the world or for all eternity—everything

would remain as it had been since the beginning." (Engels, The Dialectics of Nature, p. 34.)

The Decadence of Empiricism

Whereas the materialism of Bacon reflected the hopeful, forward-looking outlook of the Renaissance and the reformation, the philosophy of the late seventeenth and early eighteenth centuries took shape in an altogether different climate. In England, the rich and powerful had received a shock in the period of the Civil War, with its "excesses." Having effectively broken the power of the absolute monarchy, the bourgeoisie no longer needed the services of the revolutionary petit bourgeoisie and the lower orders of society, the shock troops of Cromwell's Model Army, who had begun to give voice to their independent demands, not only in the field of religion, but by calling into question the existence of private property.

Cromwell himself had crushed the left wing represented by the Levellers and Diggers, but the wealthy Presbyterian merchants of the City of London did not feel safe until, after Cromwell's death, they had invited Charles back from France. The compromise with the Stuarts did not last long, and the bourgeoisie was forced to eject Charles' successor James from the throne. But this time there was no question of appealing to the masses for support. Instead they called on the services of the Dutch Protestant, William of Orange, to take possession of the English throne, on condition of accepting the power of Parliament. This compromise, known as the "Glorious Revolution," (although it was neither) established once and for all the power of the bourgeoisie in England.

The stage was set for a rapid growth of trade and industry, accompanied by giant advances of science. In the realm of philosophy, however, it did not produce great results. Such periods are not conducive to broad philosophical generalisations. "New times," wrote Plekhanov, "produce new aspirations, the latter producing new philosophies." The heroic revolutionary age was past. The new ruling class wanted to hear no more of such things. They even baptised the real revolution, which had broken the power of their enemies, "The Great Rebellion." The men of money were guided by narrow practical considerations, and looked with distrust at theory, although they encouraged scientific research which had practical consequences, translatable into pounds, shillings and pence. This mean-spirited egotism permeates the philosophical thinking of the period, at least in England, where it was only enlivened by the writings of satirists like Swift and Sheridan.

The further evolution of the empiricist trend revealed its limited character, which ended up by leading Anglo-Saxon philosophy into a cul-de-sac out of which it has still not emerged. This negative side of "sensationalism" was already evident in the writings of David Hume (1711-76) and George Berkeley (1685-1753). The latter was the bishop of Cloyne in Ireland, who lived just at the end of a stormy period when Ireland had been drawn into the maelstrom of England's Civil War and subsequent dynastic and religious upheavals ending in the "Glorious Revolution" and the Battle of the Boyne, where the interests of the Irish people were betrayed in a struggle between an English and a Dutch Pretender, neither of whom had anything to do with them.

Reflecting the prevailing mood of philosophical conservatism, Berkeley was obsessed

with the need to oppose what he saw as the subversive trends in contemporary science, which he interpreted as a threat to religion. An astute, if not original thinker, he soon realised that it was possible to seize upon the weak side of the existing materialism, in order to turn it into its exact opposite. This he did quite effectively in his most important work, A Treatise Concerning the Principles of Human Knowledge (1734).

Taking as his starting point Locke's philosophical premises, he attempted to prove that the material world did not exist. Locke's empiricist theory of knowledge begins with the self-evident proposition: "I interpret the world through my senses." However, it is necessary to add the equally self-evident statement that the world exists independent of my senses, and that the impressions I obtain through my senses come from the material world outside me. Unless this is accepted, we very quickly land up in the most grotesque mysticism and subjective idealism.

Berkeley was well aware that a consistent materialist position would lead to the complete overthrow of religion. He was, for instance, deeply suspicious of the new science, which seemed to leave no room for the Creator. Newton professed himself a believer. But his explanation of the universe as a vast system of moving bodies, all acting in accordance with the laws of mechanics, shocked the bishop. Where did God come into all this? he asked. True, Newton assigned to the Almighty the task of getting it all started with a push, but after that, God did not seem to have been left very much to do!

Locke, like Newton, never renounced religion, but the bare declaration that God exists (deism), while giving Him no real role in the affairs of man or nature was merely a convenient fig leaf to conceal unbelief. As Marx put it, "for materialism, deism is but an easy-going way of getting rid of religion." (MECW, Vol. 4, p. 129.) Following Newton, Locke was happy to take for granted the existence of an obliging Deity who, after giving the universe a bit of a shove, then retired to the celestial sidelines for the rest of eternity to allow men of science to get on with their work. It was the philosophical equivalent of the constitutional monarchy established as a compromise between parliament and William III after the "Glorious Revolution" of 1688, which, incidentally, was Locke's political ideal.

The deist disguise, however, did not fool Berkeley for a moment. There was an evident weak link. What if the universe did not start in this way? What if it had always existed? Locke and Newton assumed that, following the laws of elementary mechanics, a clockwork universe must have commenced with an external impulse. But there was no way they could disprove the contrary assertion, that the universe had existed eternally. In that case, the last vestige of a role for the Creator vanished altogether. Locke also supposed that, in addition to matter, the universe contained "immaterial" substances, minds and souls. But, as he himself confessed, this conclusion did not flow necessarily from his system. Consciousness might just be another property of matter (which is just what it is in fact)—the property of matter organised in a certain way. Here too, Locke's concessions to religion hung uneasily from his materialist premises, as if they had been tacked on as an afterthought.

Berkeley's philosophy, like that of Hume, is the expression of a reaction against the revolutionary storm and stress of the previous period, identified in his mind with

materialism, the root cause of atheism. Berkeley consciously set out to eradicate materialism once and for all, by the most radical means—by denying the existence of matter itself. Beginning with the undeniable assertion that "I interpret the world through my sense," he draws the conclusion that the world only exists when I perceive it—esse is percipi (to be is to be perceived). "The table I write on I say exists, that is, I see and feel it; and if I were to go out of my study I should say it existed—meaning thereby that if I was in my study I might perceive it, or that some other spirit actually does perceive it...

"For, what are the forementioned objects but the things we perceive by sense? And what do we perceive besides our own ideas or sensations? And is it not plainly repugnant that any one of these, or any combination of them, should exist unperceived?" (Berkeley, The Principles of Human Knowledge, pp. 66-7.)

This, then, is where empiricism, inconsistent materialism, gets us when carried to its logical, or, rather, illogical, conclusions. The world cannot exist unless I observe it. For this is exactly what Berkeley says. In fact, he considers it strange that anyone should believe otherwise: "It is indeed an opinion strangely prevailing amongst men, that houses, mountains, rivers, and in a word all sensible objects, have an existence, natural or real distinct from their being perceived by the understanding." (Ibid., p. 66.) The question arises as to what it is that makes the world real by the mere act of perceiving it. Berkeley replies: "This perceiving, active being is what I call MIND, SPIRIT, SOUL, or MYSELF." (Ibid., p. 65.)

All this is admirably clear and unambiguous. It is the doctrine of subjective idealism, with no "ifs" or "buts." The modern philosophers of the different schools of logical positivism follow in just the same line, but lack both Berkeley’s style and his honesty. The consequence of this line of argument is extreme mysticism and irrationality. Ultimately, it results in the notion that only I exist, and that the world only exists insofar as I am present to observe it. If I walk out of the room, it no longer exists, and the like. How did Berkeley deal with this objection? Very easily. There may be objects that are not perceived by my mind, but they are perceived by the "cosmic mind" of God, and exist in it. Thus, at a single stroke, the Almighty, who was reduced to a precarious existence on the margins of a mechanical universe, has been reintroduced as the "whole choir of Heaven and furniture of the earth," in a world entirely free of matter. In this way, Berkeley believed that he had scored the "most complete and easy triumph in the world" over "every wretched sect of atheists."

In purely philosophical terms, Berkeley’s philosophy is open to many objections. In the first place, his main criticism of Locke was that he duplicated the world, that is, he supposed that behind the sense-perceptions which, according to empiricism, are the only things we can know, there was an external world of material things. To remove this duality, Berkeley simply denied the existence of the objective world. But this does not solve the problem at all. We are still left with something outside our sense-perceptions. The only difference is that this "something" is not the real, material world, but, according to Berkeley, the immaterial world of spirits created by the "cosmic mind" of God. In other words, by taking our sense-impressions as something independent, separate and apart from the objective material world outside us, we quickly land in the realm of spiritualism, the worst kind of mysticism.

Berkeley’s arguments only retain a degree of consistency if one accepts his initial premise, that we can only know sense-impressions, but never the real world outside ourselves. This is put forward dogmatically at the beginning, and all the rest is derived from this proposition. In other words, he presupposes what has to be proved, namely that our sensations and ideas are not the reflection of the world outside us, but things existing in their own right. They are not a property of matter that thinks, of a human brain and nervous system, capable of being investigated and understood scientifically, but mysterious things of the spirit world, emanating from the mind of God. They do not serve to connect us with the world, but constitute an impenetrable barrier, beyond which we cannot know anything for sure.

By pushing the arguments of empiricism to the limit, Berkeley succeeded in turning it into its opposite. Engels points out that even Bacon in his natural history gives recipes for making gold, and Newton in his old age "greatly busied himself with expounding the Revelation of St. John. So it is not to be wondered at if in recent years English empiricism in the person of some of its representatives—and not the worst of them—should seem to have fallen a hopeless victim to the spirit-rapping and spirit-seeing imported from America." (Engels, The Dialectics of Nature, p. 69.) As we shall see, the propensity for mystical thinking does not disappear, but rather appears to grow in geometrical proportion to the advance of science. This is the price we have to pay for the cavalier attitude of scientists who wrongly imagine that they can get along without any general philosophical principles. Expelled by the front door, philosophy immediately flies back in through the window, and invariably in its most retrograde and mystifying form.

Just as all ideas ultimately are derived from this objective material world, which is said not to exist by Berkeley, so, in the last analysis, their truth or otherwise is decided in practice, through experiment, by countless observations, and, above all, through the practical activity of human beings in society. Berkeley lived at a time when science had largely succeeded in freeing itself from the deadly embrace of religion, and had thereby made possible the greatest advances. How did Berkeley’s ideas fit in with all this? What kind of explanation do Berkeley’s ideas give of the material world? How do they relate to the discoveries of Galileo, Newton and Boyle? For example, the corpuscular theory of matter cannot be true, according to Berkeley, because there is nothing for it to be true of.

Berkeley rejected Newton’s theory of gravity, because it attempted to explain things by "corporeal causes." Naturally enough, since, while the sun and moon, being material, have mass, my sense-impressions of these have none whatever and can exercise a gravitational pull only on my imagination. He likewise disapproved of the most important mathematical discovery of all—the differential and integral calculus, without which the achievements of modern science would not have been possible. But no matter. Since the concept of infinite divisibility of "real space" ran counter to the basic postulates of his philosophy, he opposed it vehemently. Having set his face against the major scientific discoveries of his day, Berkeley ended his life extolling the properties of tar-water as an elixir to cure all ills. One could be excused for thinking that such an eccentric philosophy as this would vanish without trace. Not so. The ideas of Bishop Berkeley have continued to exercise a strange fascination on bourgeois philosophers down to the present day, being the true origin and basis of the theory of knowledge ("epistemology") of logical

positivism and linguistic philosophy. This was dealt with brilliantly by Lenin in his book Materialism and Empirio-Criticism, to which we shall return later.

Incredible as it may seem, this thoroughly irrational and anti-scientific philosophy has penetrated the thinking of many scientists, through the agency of logical positivism in different guises. In Berkeley's lifetime his ideas did not get much of an echo. They had to wait for the intellectual climate of our own contradictory times, when the greatest advances of human knowledge rub shoulders with the most primitive cultural throwbacks to get accepted in polite society. As G. J. Warnock points out, in the Introduction to The Principles of Human Knowledge, Berkeley philosophy "in our own day has won far more general support than ever before." Thus, "today some physicists...are inclined to argue exactly as he did, that physical theory is not a matter of factual truth, but essentially of mathematical and predictive convenience." (G. J. Warnock, The Principles of Human Knowledge, p. 25.) The scientist and idealist philosopher Eddington claimed that we "have a right to believe that there are, for instance, colours seen by other people but not by ourselves, toothaches felt by other people, pleasures enjoyed and pains endured by other people, and so on, but that we have no right to infer events experienced by no one and not forming part of any 'mind.'" (Russell, op. cit., p. 631.) Logical positivists like A. J. Ayer accept the argument that we can only know "sense-contents" and, therefore, the question as to the existence of the material world is "meaningless." And so on and so forth. Old Berkeley must be laughing in his grave!

The value of any theory or hypothesis is ultimately determined by whether it can be applied successfully to reality, whether it enhances our knowledge of the world and our control over our lives. A hypothesis which does none of these things is good for nothing, the product of idle speculation, like the disputations of the mediaeval Schoolmen about how many angels can dance on the head of a pin. A colossal amount of time has been wasted in universities on endlessly debating this kind of thing. Even Bertrand Russell is compelled to admit that a theory like Berkeley's, which "would forbid us to speak about anything that we have not ourselves explicitly noticed. If so, it is a view that no one can hold in practice, which is a defect in a theory that is advocated on practical grounds." Yet in the very next sentence he feels obliged to add that "The whole question of verification, and its connection with knowledge, is difficult and complex; I will, therefore, leave it on one side for the present." (Op. cit., p. 632.) These questions are only "difficult and complex" for someone who accepts the premise that all we can know are sense-data, separate and apart from the material world. Since this is the starting point of a great deal of modern philosophers, no matter how they twist and turn, they cannot dig themselves out of the trap set by Bishop Berkeley.

The End of the Road

The philosophy of empiricism, which began its life with such great expectations, finally comes to a dead stop with David Hume (1711-76). An arch-Tory, Hume followed faithfully in the path laid down by Berkeley, albeit more cautiously. His most famous work, the Treatise on Human Nature was published in 1739 in France where it went down like a lead balloon. For Hume, reality is only a string of impressions, the causes of which are unknown and unknowable. He regarded the question of the existence or non-existence of the world to be an insoluble problem, and was one of the first of those

philosophers to translate their ignorance into Greek and call it agnosticism. In essence, what we have here is a throwback to the idea of the Greek sceptics that the world is unknowable.

His main claim to fame rests on the section of his work entitled Of Knowledge and Probability. Here also he was not original, but merely developed an idea already present in Berkeley, namely the non-existence of causation. Arguing against the discoveries of the newly developed science of mechanics, he tried to show that mechanical causation did not exist, that we cannot say that a particular event causes another event, but only that one event follows another. Thus, if we boil a kettle of water to a hundred degrees centigrade, we cannot say that this action has caused it to boil, but only that the water boiled after we heated it. Or if a man is knocked over by a ten-ton truck, we have no right to affirm that his death was caused by this. It just succeeded it in time. That is all.

Does this seem incredible? But it it is the inevitable result of the strict application of this kind of narrow empiricism, which demands of us that we stick to "the facts, and nothing but the facts." All we can say is that one fact follows another. We have no right to assert that one thing actually causes another, since this would be to go beyond the single fact registered by our eyes and ears at a given moment in time. All of which forcibly brings to mind the warning of old Heraclitus: "Eyes and ears are bad witnesses for men who have souls that understand not their language."

Once again, it is astonishing to note that, of all the marvellous philosophical ideas produced in the last two centuries or so, modern philosophers and scientists choose to take as their starting-point and inspiration the writings of...Hume! His denial of causality has been eagerly seized upon in order to provide some ideological support for certain incorrect philosophical conclusions which Heisenberg and others have attempted to draw from quantum mechanics. We shall speak of that later. In essence, Hume asserts that, when we say "A" causes "B," we only mean that these two acts have been seen together many times in the past, and that, therefore, we believe they may be repeated in the future. This, however, is not a certainty but only a belief. It is not necessity, but only probability. Thus, "necessity is something that exists in the mind, not in objects."

First of all, to deny causation leads us to the denial of scientific and rational thought in general. The whole basis and "raison d’ tre" of science is the attempt to provide a rational explanation for the observed phenomena of nature. From the observation of a large number of facts, we draw general conclusions, which, if they have been sufficiently tested and shown to have a wide application, acquire the status of scientific laws. Naturally, all such laws reflect the state of our knowledge at a given stage of human development, and, consequently, are subsequently overtaken by other theories and hypotheses, which explain things better. In the process, we gradually arrive at a deeper understanding both of nature and ourselves. This process is as limitless as nature itself. Thus, to look for an Absolute Truth, which would explain everything, or, to use a fashionable expression, a Grand Universal Theory (GUT) is about as profitable as looking for the philosopher’s stone.

The fact that a particular generalisation may be falsified at a given moment does not entitle us to dispense with generalisations altogether. Nor does it mean that we have to

renounce the search for objective truth, taking refuge in a sceptical attitude, like that of Hume, which, because of its complete and utter irrelevance to our actual practice, whether in science or in everyday life, is really just a pretentious pose, just like the idiotic posing of those who deny the existence of the material world, but who do not, on that account, refrain from eating and drinking, and who, while firmly maintaining the non-existence of causality, are very careful to avoid untimely physical encounters with ten-ton trucks.

All natural laws are based on causality. The ocean tides are caused by the gravitational pull of the sun and moon. The splitting of the atom causes a nuclear explosion. Deprivation of food and drink over a long period causes death by starvation, and being run over by a lorry causes the same result by other means. The existence of causality is as certain as anything can be in this sinful material world of ours. But not certain enough for the disciples of Hume. Accepting his line of argument, all future prediction becomes irrational, because there is always the possibility that things will turn out differently. Bertrand Russell, supposely with a straight face, explains: "I mean that, taking even our firmest expectations, such as that the sun will rise tomorrow, there is not a shadow of reason for supposing them more likely to be verified than not." (Op. cit., p. 641.) Further on he says: "For example: when (to repeat a former illustration) I see an apple, past experience makes me expect that it will taste like an apple, and not like roast beef; but there is no rational justification for this expectation." (Ibid., p. 643.)

Since we cannot know anything, according to Hume, he concludes that "all our reasonings concerning causes and effects are derived from nothing but custom; and that belief is more properly an act of the sensitive, than of the cogitative part of our natures." (Hume, Book 1, part 3, sect. 4.) In other words, knowledge is abandoned in favour of belief.

It should be borne in mind that the declared intention of all this is to eliminate metaphysics from thought, which will thus be limited to a bare and, hopefully, scientific enumeration of the "facts." Some wit once defined metaphysics as "a blind man, in a dark room, looking for a black hat which isn’t there." This phrase adequately describes the metaphysical fumbling of those who, by denying causation immediately open the door to irrationality. With Hume, empirical philosophy comes full circle. As Russell correctly says:

"The ultimate outcome of Hume’s investigation of what passes for knowledge is not what we must suppose him to have desired. The sub-title of his book is: ‘An attempt to introduce the experimental method of reasoning into moral subjects.’ It is evident that he started out with a belief that scientific method yields the truth, the whole truth, and nothing but the truth; he ended, however, with the conviction that belief is never rational, since we know nothing. After setting forth the arguments for scepticism (Book I, part iv, sec. i), he goes on, not to refute the arguments, but to fall back on natural credulity." (Op. cit., p. 644.)

One may be tempted to ask what the practical worth of such a philosophy is. On this point no answer is forthcoming from Hume, who comments with the utmost frivolity, tinged with cynicism: "This sceptical doubt, both with respect to reason and the senses, is

a malady, which can never be radically cured, but must return upon us every moment, however we may chase it away, and sometimes may seem entirely free from it...Carelessness and inattention alone can afford us any remedy. For this reason I rely entirely upon them; and take it for granted, whatever may be the reader's opinion at this present moment, that an hour hence he will be persuaded there is both an external and an internal world." (Op. cit., p. 645.) This is not real philosophy but precisely a metaphysical dead end. It tells us nothing about the world, and leads nowhere. Just what one would expect from a man who thought that there was no reason to study philosophy except as a pleasant way of passing the time. And indeed, there is certainly no reason to study Hume's philosophy except as a pointless way of wasting time.

On one thing we can agree with Bertrand Russell. The philosophy of Hume represents "the bankruptcy of 18th-century reasonableness." Hume's ideas, like Berkeley's, represent a move in the direction of subjective idealism. It is empiricism turned inside out. From the starting point that everything was learnt from experience, we arrive at the conclusion that nothing can be learnt from experience and observation. This is the antithesis of the progressive scientific spirit with which the period opened. Nothing positive can be obtained from such an outlook. We may therefore safely leave those who cannot be sure that the sun will rise tomorrow where we found them—in the dark, where they can find some consolation for their difficulties by looking forward one day to eating an apple which tastes like roast beef.

The Birth of French Materialism

From this point on, the road to further development of philosophy in Britain was blocked, but not before it had given a powerful impulse to the movement which became known as the Enlightenment in France. The difference between English empiricism and French materialism is sometimes ascribed to difference of national temperament. For instance:

"To carry out the empiricism of Locke into its ultimate consequence, into sensualism and materialism—this is the task which has been assumed by the French. Though grown on a soil of English principles, and very soon universally prevalent there, empiricism could not possibly be developed amongst the English into the extreme form which presently declared itself among the French—that is, into the complete destruction of all the foundations of the moral and religious life. This last consequence was not congenial to the national character of the English." (Schwegler) (Schwegler, op. cit., p. 184.)

The existence of different national temperaments and traditions undoubtedly played a major role, as Marx and Engels pointed out in The Holy Family: "The difference between French and English materialism reflects the difference between the two nations. The French imparted to English materialism wit, flesh and blood, and eloquence. They gave it the temperament and grace that it lacked. They civilised it." (MECW, Vol. 4, pp. 129-30.)

Nonetheless, to explain great historical movements it is not sufficient to appeal to national characteristics alone. The character of the French and English were also different a hundred years before, without producing either Hume or Voltaire, who were products of their own time, or, more accurately, products of a particular concatenation of circumstances, social, economic and cultural. The philosophy of Berkeley and Hume

emerged in a period when the bourgeoisie had already triumphed, and was trying to lay revolution to rest. That of Concordet, Diderot and Voltaire belongs to an entirely different period—the period of social and intellectual ferment leading up to the revolution of 1789-93. In an important sense the struggle of the "philosophers" against religion and orthodoxy was a preparation for the storming of the Bastille. Before the old order was overthrown in fact, it first had to be shown to be redundant in the minds of men and women.

In his excellent essay on Holbach and HelvŽtius, Plekhanov has this to say about 18th century French philosophy:

"Eighteenth-century materialist philosophy was a revolutionary philosophy. It was merely the ideological expression of the revolutionary bourgeoisie's struggle against the clergy, the nobility, and the absolute monarchy. It goes without saying that, in its struggle against an obsolete system, the bourgeoisie could have no respect for a world-outlook that was inherited from the past and hallowed that despised system. 'Different times, different circumstances, a different philosophy,' as Diderot so excellently put it in his article on Hobbes in the EncyclopŽdie." (Plekhanov, Selected Philosophical Works, Vol. 2, p. 45.)

The ideas of Locke had a great impact on the Abbe de Condillac (1715-80). Condillac accepted Locke's teaching that all knowledge comes from the senses, but went even further, claiming that all mental processes, even the will, are only modified sensations. He never actually denied the existence of God, but nevertheless maintained that only matter existed. A very remarkable conclusion for someone who was a priest. Another disciple of Locke, Claude Adrien HelvŽtius (1715-71), with whom, said Marx, "materialism assumed a really French character." HelvŽtius was so outspoken that even his fellow materialists were taken aback, and did not dare follow him in his bold conclusions.

Baron Holbach (1723-89), although a German, spent most of his life in France, where he played a major role in the materialist movement. Like HelvŽtius, he was persecuted by the Church, and his book Le Syst me de la Nature was publicly burnt by order of the Paris Parliament. A determined materialist, Holbach attacked religion and idealism, especially the ideas of Berkeley. Locke already thought it possible that matter could possess the faculty of thinking, and Holbach enthusiastically agreed, but, unlike Locke, was prepared to draw all the conclusions, throwing religion and the Church out of the window:

"If we consult experience, we shall see that it is in religious illusions and opinions that we should seek for the real source of the host of evils that we everywhere see overwhelming mankind. Ignorance of natural causes has led it to create its Gods; deception has made the latter terrible; a baneful concept of them has pursued man without making him any better, made him tremble uselessly, filled his mind with chimeras, opposing the progress of reason, and hindering the search for happiness. These fears have made him the slave of those who deceived him under the pretext of caring for his good; he did evil when he was told that his Gods called for crimes; he lived in adversity because he was made to hear that his Gods had condemned him to misery; he never dared to resist his Gods or to cast

off his fetters, because it was drummed into him that stupidity, the renunciation of reason, spiritual torpor and abasement of the soul were the best means of winning eternal bliss." (Quoted in Plekhanov, op. cit., p. 72.)

La Mettrie (1709-51) went still further in recognising that all forms of life, plant and animal (including man), consisted of matter organised in different ways. His main works were the famous L' Homme Machine, (Man, a Machine), and Le Syst me d'Epicure (The System of Epicurus). La Mettrie was partly a follower of Descartes, who said that animals were machines in the sense that they could not think. Taking this literally, La Mettrie said that man also must be a machine, then, because there was no qualitative difference between man and the animals. This merely reflects the predominant influence of mechanics on the scientific thinking of the period.

The intention of La Mettrie was to oppose the idea that man was a special creation of God, something entirely set aside from the rest of nature, by the special privilege of an immortal soul. This argument, in effect, was already disposed of by the English materialist and scientist Joseph Priestley, remembered today mainly as the discoverer of oxygen:

"The power of cutting, in a razor, depends upon a certain cohesion, and arrangement of the parts of which it consists. If we suppose this razor to be wholly dissolved in any acid liquor, its power of cutting will certainly be lost, or cease to be, though no particle of the metal that constituted the razor be annihilated by the process; and its former shape, and power of cutting, etc., may be restored to it after the metal has been precipitated. Thus when the body is dissolved by putrefaction, its power of thinking entirely ceases." (Quoted in Plekhanov, op. cit., p. 82, footnote.)

La Mettrie considered that thought was one of the properties of matter:

"I believe thinking to be so little incompatible with organised matter that it seems to be a property of the latter in the same way as electricity, the faculty of movement, impenetrability, extent, etc." (Ibid., p. 333.)

From the radical materialism and rationalism of the Enlightenment it was easy to draw revolutionary conclusions, and this was done. Voltaire (1694-1778), although not really a philosopher, played a prominent role in this movement, as a writer, historian and pamphleteer. He was arrested twice for his political satires, and had to spend most of his life outside France. Voltaire's greatest contribution was his collaboration with Diderot in the great Encyclopaedia (1751-80) a massive undertaking which gave a systematic summary of all the scientific knowledge of the time. A galaxy of the greatest French thinkers participated in this unique task: Montesquieu, Rousseau, Voltaire, Holbach, HelvŽtius, and other progressive and materialist philosophers combined to produce a militant work directed against the basis of the existing social order, its philosophy and morality.

Compared to the writings of the French materialists, the philosophical views of Jean-Jacques Rousseau represent a step backwards. Nevertheless, in the field of social criticism, he produced a number of masterpieces, and Engels specifically singles out for

praise his work The Origins of Inequality Among Men. Still, as he is also not really a philosopher in the strict sense, we will not enter into his ideas more fully here.

In general, these writers were preparing the ground for the bourgeois revolution of 1789-93. Their fierce denunciations are directed against the evils of feudalism and the Church. The ideal for most of them was a constitutional monarchy. Nevertheless, it is easy to see how later on people began to draw socialist and communist conclusions from their writings:

"There is no need for any great penetration," say Marx and Engels, "to see from the teaching of materialism on the original goodness and equal intellectual endowment of men, the omnipotence of experience, habit and education, and the influence of environment on man, the great significance of industry, the justification of enjoyment, etc., how necessarily materialism is connected with communism and socialism. If man draws all his knowledge, sensation, etc., from the world of the senses and the experience gained in it, then what has to be done is to arrange the empirical world in such a way that man experiences and becomes accustomed to what is truly human in it and that he becomes aware of himself as man.

"If correctly understood interest is the principle of all morality, man’s private interest must be made to coincide with the interest of humanity. If man is unfree in the materialistic sense, i.e., is free not through the negative power to avoid this or that, but through the positive power to assert his true individuality, crime must not be punished in the individual, but the anti-social sources of crime must be destroyed, and each man must be given social scope for the vital manifestation of his being. If man is shaped by environment, his environment must be made human. If man is shaped by nature, he will develop his true nature only in society, and the power of his nature must be measured not by the power of the separate individual but by the power of society." (MECW, Vol. 4, pp. 130-1.)

Chapter Five
Descartes, Spinoza and Leibniz

"The chief defect of all previous materialism (that of Feuerbach included) is that things, reality, sensuousness are conceived only as the form of the object, or of contemplation, but not as sensuous human activity, practice, not subjectively. Hence, in contradistinction to materialism, the active side was set forth abstractly by idealism—which, of course, does not know real, sensuous human activity, practice, not subjectively." (MECW, Vol. 5, p. 3.)

This phrase of Marx, from the First Thesis on Feuerbach has often caused a certain puzzlement. Its meaning is not immediately clear, nor can it be made clear unless we place it in the context of the history of philosophy. Yet the idea contained within it is the starting-point for the development of dialectical materialism, and of Marxism in general.

Once thought begins to develop, it takes on a certain life of its own, which proceeds more rapidly with the development of the division of labour and the growth of civilisation, which coincides with the division of society into classes. Thought itself becomes an object of study. Its material origins are lost sight of. It appears as something mystical, separate and apart from matter, a divine substance, linked to God, an immortal soul, independent of our body, which will not perish when we die.

The rise of a new kind of materialism in the period of the Renaissance was the prior condition for the rebirth of science on a qualitatively higher level. But, as we have seen, it suffered from a one-sidedness, in the form of empiricism, which had extremely negative consequences. The denial of the validity of anything which did not come from immediate observation, the rejection of theory and broad generalisations ("I do not make hypotheses," Newton said) doomed this kind of materialism to sterility. The main result was that the representatives of this school could not rise above the limitations of the outlook of the science of the day, which was fundamentally mechanical and static in character. This defect applies not only to the English empiricists, but even to the French materialists, despite their far broader outlook and occasionally brilliant forays into dialectics.

The old materialism was one-sided in that it considered human thought in a static, passive and contemplative way. Man was merely an observer of nature, taking note of "the facts." "The mind is to it in itself void, a mere mirror of the external world, a mere mirror of the external world, a dark room into which the images of the things without fall, without any contribution or action its part; its entire contents are due to the impressions made on it by material things." (Schwegler, op. cit., p. 180-1.) Setting out from a correct idea, this narrow conception of materialism ended up in a blind alley, incapable of further development. In fact, until the revolution effected by Marx and Engels and their theory of materialist dialectics, no further development of materialism took place. Even Feuerbach really went no further than the French materialists of the 18th century.

We therefore come face to face with one of the greatest paradoxes in the history of

philosophy—that the really significant advances in thought in the period after Locke were made, not by the materialists, but by the idealists. Unrestricted by the self-imposed limits of empiricism, they arrived at a whole series of brilliant theoretical generalisations, although, setting out from false hypotheses, they invariably had a fantastic character. This peculiar phenomenon reached its most extreme expression in the philosophy of Hegel, "the most colossal miscarriage in history," where all the main elements of dialectics appear in a systematic form, but standing on their head, as Marx put it.

That thought and being are two different things is self-evident to most people. In one of his comedies, Sheridan, the great Irish dramatist of the 18th century, makes one of his characters, an inveterate gambler, say "I never lose at cards—or, at least, I never feel that I am losing, which is the same thing." Of course, we know that it is not the same thing, just as it is not the same thing to think one has a million pounds, and actually to possess that amount of money. Thought itself is immaterial, despite the efforts of some mechanical materialists to prove that it is a material substance, secreted by the brain, as bile is secreted from the liver. Thought is the property of matter organised in a particular way, but it is not itself matter. The question arises, if thought and material reality are completely different, how does it happen that they are so often found to be in agreement? The exact relation between thought and being was the source of all the main philosophical disputes for two and a half thousand years, and was only resolved satisfactorily by dialectical materialism.

The question of the relation of thought to being was posed by the French philosopher Descartes (1596-1650) in a different way to the English empiricists. Born into a moderately wealthy family, he had studied with the Jesuits. This taste of arid orthodoxy produced in him a lifetime’s aversion for dogmatism of any kind, and an impatience with received ideas. His scepticism, in contrast with the jaundiced pessimism of Hume, had a lively and positive character. He began to doubt, not the possibility of knowledge in general, but only the existing opinions put forward as infallible truths. From an early age, his motto was "Doubt everything."

"And, as I made it my business in each matter to reflect particularly upon what might fairly be doubted and prove a source of error, I gradually rooted out from my mind all the errors which had hitherto crept into it. Not that in this I imitated the skeptics who doubt only that they may doubt, and seek nothing beyond uncertainty itself; for, on the contrary, my design was singly to find ground of assurance, and cast aside the loose earth and sand, that I might reach the rock or the clay." (Descartes, Discourse on Method, p. 23)

"For these reasons," he wrote, "as soon as my age permitted me to pass from under the control of my instructors, I entirely abandoned the study of letters, and resolved no longer to seek any other science than the knowledge of myself, or of the great book of the world." (ibid, p. 8.) In order to gain knowledge and expand his horizons he enlisted first in the Dutch and then the Bavarian army, at the start of the Thirty Years War. While still in the army, he wrote a book on philosophy, but, on hearing of the trial of Galileo, he decided to withhold publication for fear of provoking the anger of the Church. Later on, his writings appear liberally sprinkled with references aimed at placating the religious authorities and averting the dreadful charge of godlessness. Even so, like Locke, he felt obliged to move to Holland, the only country in Europe where there existed a relatively

free atmosphere to speak and write. Even here he faced the attacks of religious bigots (in this case, Protestants), who accused him of atheism. Only the personal intervention of the Prince of Orange saved him from prosecution. Even then, the authorities of the University of Leyden placed him under a total ban, forbidding the very mention of his name. Eventually, he had to move to Sweden, where he died, partly because of the effects of the climate on his weak constitution.

While, in all probability, Descartes was a believer, when reading his works, one has the impression of a man all the time looking over his shoulder. In order to get round the Church, Descartes accepts the existence of God, but then says that religion is too lofty a subject to be "submitted to the impotency of our reason." When dealing with natural history, he accepts that God created the world, but then adds, as if hypothetically, that "it may be believed, without discredit to the miracle of creation, that, in this way alone, things purely material might, in course of time, have become such as we observe them at present; and their nature is much more easily conceived when they are beheld coming in this manner gradually into existence, than when they are only considered as produced at once in a finished and perfect state." (Ibid., p, 36.) To such subterfuges did the greatest French philosopher have to resort in order to publish his ideas.

In the field of science, Descartes' approach was the exact opposite of his English counterparts. Whereas they put all the emphasis on experiment, his approach was rationalistic, more concerned with general principles than the detailed work of observation. His contribution to science was outstanding, especially in the field of mathematics, where he may be considered one of the founders of analytical geometry. His great contribution was the invention of co-ordinate geometry, which determines the position of a point in a plane by its distance from two fixed lines. In physics, he was a materialist, as Marx and Engels point out:

"Descartes in his physics endowed matter with self-creative power and conceived mechanical motion as the manifestation of its life. He completely separated his physics from his metaphysics. Within his physics, matter is the sole substance, the sole basis of being and of knowledge." (MECW, Vol. 4, p. 125.)

Yet Descartes was unable to resolve the fundamental question of the relation between thought and being. In his celebrated Discourse on Method, he searches for a truth which everyone can accept as unquestionable. He comes up with the famous phrase "I think, therefore I am." This is the corner-stone of his philosophy. And yet it does not follow. At most he could assert, "I think, therefore thought exists." What is this "I"? Evidently a human nervous system, a brain, a body, and so on. Gassendi, the French materialist, objected that existence may equally well be inferred from every other human function. Idealists replied that none of these functions can be perceived without thought. But it is also necessary to say what thought is.

Thought, from a consistent materialist position is matter that thinks. It does not and cannot exist by itself, separate from matter. On this decisive question Descartes adopted an unsatisfactory and inconsistent position, which ended up in all kinds of contradictions. The fundamental difference between thought and matter, he said, was that matter had extension, whereas thought, spirit, soul, had none. This leads us straight to a dualist

position. According to Descartes, there is nothing in common between thought and matter. They are not only different, but diametrically opposed. The union of soul and body is, therefore, an entirely mechanical one. The soul inhabits the body as an alien thing, a mechanical and entirely artificial relationship. Without the soul, the body is like a lifeless machine or automatum. Even the best-constructed robot cannot acquire a human consciousness, even if it is programmed to speak (this was written in 1637, but the subject matter is very modern).

For example, a machine may be taught to speak and even express "feelings," "but not that it should arrange them variously so as appositely to reply to what is said in its presence, as men of the lowest grade of intellect can do. The second test is, that although such machines might execute many things with equal or perhaps greater perfection than any of us, they would, without doubt, fail in certain others from which it could be discovered that they did not act from knowledge, but solely from the disposition of their organs: for while reason is an universal instrument that is alike available on every occasion, these organs, on the contrary, need a particular arrangement for each particular action; whence it must be morally impossible that there should exist in any machine a diversity of organs sufficient to enable it to act in all the occurrences of like, in the way in which our reason enables us to act." (Descartes, op. cit., pp. 44-5.)

The lower animals are classed as "automata" for the same reason. It is worth quoting this passage at some length because it shows a markedly materialist line of argument, and certainly is vastly superior to the mystical nonsense talked by some scientists today in relation to animal intelligence, such as our friend Dr. Wickremassinge and his ants, who keep the secret of their success to themselves:

"For it is highly deserving of remark, that there are no men so dull and stupid, not even idiots, as to be incapable of joining together different words, and thereby constructing a declaration by which to make their thoughts understood; and that on the other hand, there is no other animal, however perfect or happily circumstanced, which can do the like. Nor does this inability arise from want of organs: for we observe that magpies and parrots can utter words like ourselves, and are yet unable to speak as we do, that is, so as to show that they understand what they say: in place of which men born deaf and dumb, and thus not less, but rather more than the brutes, destitute of the organs which others use in speaking, are in the habit of spontaneously inventing certain signs by which they discover their thoughts to those who, being usually in their company, have leisure to learn their language.

"And this proves not only that the brutes have less reason than man, but that they have none at all: for we see that very little is required to enable a person to speak; and since a certain inequality of capacity is observable among animals of the same species, as well as among men, and since some are more capable of being instructed than others, it is incredible that the most perfect ape or parrot of its species, should not in this be equal to the most stupid infant of its kind, or at least to one that was crack-brained, unless the soul of brutes were of a nature wholly different form ours." (Ibid., pp. 45-6.)

Descartes’ idealism led him into the trap of dividing mind from body, and regarding the body as a mere automaton, inside which the soul dwelt. This became a source of

considerable confusion, and had a harmful effect on the scientific understanding of the real nature of the mind and its relation to the body, the brain and the nervous system.

Despite the generally idealist thrust of the Discourse, Descartes' materialist physics and biology keep on intruding. He cannot, for example, conceal his enthusiasm for Harvey's discovery of the circulation of the blood, to which he dedicates no fewer than six pages. Yet when he comes to the vexed question of the relationship of mind and body, he takes refuge in unscientific and metaphysical concepts. He locates the soul in the so-called "pineal gland" in the centre of the brain, purely because all the other parts of the brain are double, and therefore disqualified from acting as the organ of the soul, which would thereby presumably end up with a bad case of double-vision!

The problem with all this is that, if thought and matter are considered as completely separate, by what means are they united and kept together? The only option open to Descartes was to bring in an external agent—divine intervention. Even so, it is impossible to see how they can have any effect upon each other. By what mechanism could they interpenetrate? For example, the mind can will that I lift my arm, but how can it actually lift it? Descartes' disciple, Geulinx, answered with admirable frankness that it could not, that the fact that the arm rises at the same time as I will it to was mere coincidence. This brings out the contradiction of the Cartesian philosophy, the unresolved dualism, which was its Achilles' heel.

Despite its weaknesses, Descartes' philosophy had a notably progressive side. Its advances in science stimulated the growth of natural science in France. Philosophically, Descartes' idealism was overthrown by the prevailing materialist trend of the Enlightenment, though he influenced people like La Mettrie. But outside France his ideas were the staring point for two of the greatest philosophers of all, Spinoza and Leibniz.

Spinoza

Benedictus (Baruch) Spinoza was born in Amsterdam in 1632, the son of a Jewish merchant, one of the many who had fled from Portugal and Spain to escape from religious persecution. From his youth, Spinoza showed himself to be a fearless searcher after truth, prepared to defend his views regardless of the consequences to himself. It was intended that he should carry on the family business, but in 1656, despite having been a diligent student of the Bible and the Talmud, he fell foul of the orthodox rabbis. He was offered 1,000 florins a year to keep silent, but refused and was cursed and expelled from the Jewish community for his "wrong opinions" and "horrible heresies." Fearing an attempt on his life, he had to flee from Amsterdam. He took up residence at Rhynsburg near Leyden, where he earned his living polishing lenses, while dedicating his spare time to his philosophical writings.

As an outcast himself, Spinoza became friendly with the members of some of the smaller Protestant sects, related to the Anabaptists, who were themselves the victims of persecution and who were open to discuss new ideas. At this time the ideas of Descartes were the subject of a raging controversy in Holland. In 1656, university professors were required to take an oath that they would not propound Cartesian ideas which caused offence. To the little circle around Spinoza, Descartes was seen as a source of inspiration,

as a brave soul who refused to base his opinions on mere tradition, and affirmed that all we know is known by the "natural light" of reason. Descartes was an inspiration to Spinoza, but the latter had too keen an intellect to accept him uncritically.

This was an age of great discoveries. Science was beginning to stretch its wings, and the old Aristotelian world view was being replaced by the new scientific-mechanistic view of nature. Galileo himself had written that he believed that the book of nature was written in the language of mathematics. Spinoza's whole outlook was dominated by a passionate interest in nature and science. He conducted a correspondence with the English chemist Robert Boyle, discussed comets with Henry Oldenburg, the secretary of the Royal Society, and comments on Descartes' laws of motion and the theories of Huygens.

Holland was the freest country in Europe at this time. The Dutch bourgeoisie had succeeded in throwing off the yoke of Spanish domination by a revolutionary struggle in which it leaned for support on the lower middle class and semi-proletarian masses. In 1579, the provinces of the Protestant Netherlands came together to form the Union of Utrecht, out of which the Dutch Republic emerged. Article three of the Union proclaimed religious toleration as a basic principle. However, from the outset this was opposed by the powerful sect of "strict" or "precise" Calvinists, who wanted only one official Church in Holland—their own.

At the Synod of Dordrecht (1618-19) they succeeded in getting Calvinism recognised as the official religion. But the liberal Jan de Wit, who was the leader of the Netherlands from 1653 to 1672, stood firm against religious intolerance. Spinoza did not stand aloof from the political struggle. He set aside work on his Ethics in order to publish a book in defence of the freedom of speech and thought, the Treatise on Theology and Politics, which appeared in 1670. This earned him the bitter enmity of the strict Calvinists, who were scandalised by his attempts to show that the Bible is not to be seen as containing philosophical or scientific truths.

In July 1670 the Synod declared the Treatise an "evil and blasphemous book." An anonymous pamphlet attacking de Wit described the book as "spawned in Hell by a renegade Jew and the Devil," and that it was "published with the knowledge of Mr. Jan de Wit." In 1672 a French army invaded Holland and de Wit was murdered by a mob in The Hague. For opportunist reasons, William of Orange sided with the Calvinists. Two years later the Treatise was banned. For the rest of his short life, Spinoza was forced to keep his head down. Tragically, his masterpiece, the Ethics, was never published in his lifetime, for fear of the reaction of the Church. It only appeared in 1677, the year the great man died of consumption.

Spinoza was one of those true geniuses who carried out a real revolution in philosophy. Taking as his starting point the philosophy of Descartes, he completely transformed it, and in so doing, laid the basis for a genuinely scientific approach to nature. "It is therefore worthy of note," wrote Hegel, "that thought must begin by placing itself at the standpoint of Spinozism; to be a follower of Spinoza is the essential commencement of all Philosophy." (History of Philosophy, Vol. 3, p. 257.) Not only Hegel, but Goethe, Schiller, Marx, and the young Schelling were much influenced by Spinoza. When Einstein was engaged in a philosophical dispute with Niels Bohr over the fundamental

problems of quantum mechanics, he wrote that he would rather have "old Spinoza" as a referee instead of Bertrand Russell or Carnap.

Maybe that is why, with his customary arrogance, Bertrand Russell in his History of Western Philosophy writes that the whole of Spinoza's "metaphysic" is "incompatible with modern logic and the scientific method. Facts have to be discovered by observation, not by reasoning; when we successfully infer the future, we do so by means of principles which are not logically necessary, but are suggested by empirical data. And the concept of substance, upon which Spinoza relies, is one which neither science nor philosophy can nowadays accept." (B. Russell, op. cit., p. 560.)

The whole point is that Spinoza, by not restricting himself to the narrow confines of empirical philosophy, was able to transcend the limits of the mechanistic science of the day. While Berkeley and Hume led philosophy into a blind alley (and also science, if it had paid any attention to them, which fortunately it did not), Spinoza brilliantly showed the way forward. In spite of the ridiculous pretensions of Russell and his fellow logical positivists, who—without the slightest basis—put themselves forward as the supreme guardians of an alleged "scientific method" arbitrarily defined by themselves, science proceeds in an entirely different way to that indicated in these lines.

In particular, the role of great hypotheses in pointing scientific research in the right direction has been fundamental. And, by definition, a hypothesis can only be based on a limited number of "facts," and must involve reasoning, and also courage and imagination. How much time and effort would have been saved if scientists had paid attention to Kant's nebular theory of the origin of the solar system, for example? And how much time is now being wasted in the search for "cold, dark matter," which is based upon no "observed facts" whatever, and which is intended to support a cosmological hypothesis more fantastic than anything Spinoza ever thought of.

"It is to the highest credit of the philosophy of the time that it did not let itself be led astray by the restricted state of contemporary natural knowledge, and that—from Spinoza down to the great French materialists—it insisted on explaining the world from the world itself and left the justification in detail to the natural science of the future." (Engels, The Dialectics of Nature, p. 36.)

Spinoza, by the strength of reason, and with the very limited scientific results available to him, arrived at one of the greatest hypotheses of all time. Breaking with Descartes, with his notion of a body without a soul and a soul without a body, he advanced the idea that body and mind are two attributes of one and the same thing. The universe is not composed of mind and matter, as alleged by Descartes' dualism. There is only a single Substance, which contains within itself all the attributes of thought and being. It is infinite and eternal, and possesses all the potential to give rise to the abundance of phenomena we see in the universe.

Spinoza gives this Substance the name of "God." But in reality, to make God equal to nature is to abolish God, a fact which was not lost on Spinoza's enemies, when they accused him of atheism. In Spinoza's universe, infinite and eternal, and therefore uncreated and unbounded by heaven or hell, there is no room for a separate deity, indeed,

no room for anything whatsoever except Substance, which is just another way of saying nature.

Thus, in a strange way, the philosophy of Spinoza, despite its idealist appearance, is the real point of departure for materialism in the dialectical, that is, non-mechanical sense of the word. All that is necessary is to substitute the word "matter" for "God," and we get a perfectly consistent materialist position. As Marx wrote in a letter to Lassalle on May 31st 1858:

"Even in the case of philosophers who give systematic form to their work, Spinoza for instance, the true inner structure of the system is quite unlike the form in which it was consciously presented by him." (MECW, Vol. 40, p. 316.) The great admiration of Marx and Engels for Spinoza was revealed by Plekhanov, who recalls a conversation he had with Engels, then an old man, in 1889: "'So do you think,' I asked, 'old Spinoza was right when he said that thought and extent are nothing but two attributes of one and the same substance?' 'Of course,' Engels replied, 'old Spinoza was quite right'." (Plekhanov, Selected Philosophical Works, Vol. 2, p. 339.)

The existence of the material universe is taken as an axiom. The model for Spinoza was geometry, which sets out with axioms—self-evident assertions which require no proof. Yet the same people who are prepared to accept on trust the axioms of Euclid (which, incidentally, so far from being self-evident truths, are open to serious objections) nevertheless display extreme reluctance to admit the reality of the material world, declaring this to be beyond our knowledge to assert. Yet this same material world is the starting-point of all our experience and knowledge. "God or a substance consisting of attributes each of which expresses eternal and infinite essence, necessarily exists," proclaims Spinoza (Spinoza, The Ethics, p. 9). Moreover, matter can neither be created nor destroyed, only changed:

"Matter is the same everywhere, and its parts are not distinguished one from the other except in so far as we conceive matter to be affected in various ways, whence its parts are distinguished one from the other modally but not in reality. E.g., we can conceive water, in so far as it is water, to be divided and its parts separated one from the other: but not in so far as it is corporeal substance, for then it is neither separated nor divided. Again, water, in so far as it is water, can be made and destroyed, but in so far as it is substance it can neither be made or destroyed." (Ibid, p. 16.)

God thus has no existence separate and apart from the material world, which has not been created because it has always existed. He is "free"—to obey the laws of nature, and so on. In other words, "God" is only nature. This Pantheism of Spinoza is really a thinly-disguised materialism. Despite its peculiar form (probably an unsuccessful attempt to ward off accusations of atheism), this is head and shoulders above the mechanistic outlook of contemporary scientists. Instead of the mechanical conception of matter being moved by an external force, here we have matter which moves according to its own inherent laws, it is "its own cause."

Thought can have no existence apart from Substance (matter). It is an attribute of matter organised in a certain way, "consequently thinking substance and extended substance are

one and the same substance, which is comprehended through this and now through that attribute." In other words, thought and matter are "one and the same thing, but expressed in two ways" (ibid., p. 42). This is a real breakthrough. In essence, we have here a correct assessment of the relation between thought and being; not, as in Descartes, a radical separation of the two, but their dialectical unity. Not thought opposed to matter, but matter that thinks. Here Spinoza comes close to an overtly materialist position: "The mind," he says, "has no knowledge of itself save in so far as it perceives the ideas of the modifications of the body" (ibid., p. 59). And again, "For the human body...is affected by external bodies in many ways and disposed to affect external bodies in many ways. But the human mind...must perceive all things which happen in the human body." (Ibid., p.53.)

This presentation was far superior to the crude conception of mechanical materialism which saw thought as a material substance secreted from the brain, as sweat from the sweat glands. Spinoza, following Descartes, says that thought differs from matter in that it has no extension. It is not a material thing, but the very function of the brain itself, its essential property. Thought is not merely an abstract contemplative activity, but the way in which thinking beings react to their environment at the conscious level. It is not possible to separate thought from all other human activities. Thought, as Spinoza understood, is one of the attributes of highly organised matter, nature that thinks, and not something opposed to nature:

"If this were so, it must seem most odd that consciousness and nature, thinking and being, the laws of thought and the laws of nature, should so closely correspond. But if we then ask what thought and consciousness are and whence they come, we find that they are products of the human brain and that man himself is a product of nature, who has developed in and along with his environment; whence it is self-evident that the products of the human brain, which in the last analysis are also products of nature, do not contradict the rest of nature’s interconnections but correspond to them." (Engels, Anti-Dühring, p. 44.)

Here thought and matter are different but not mechanically opposed, mutually exclusive opposites. Spinoza understood that matter ("Substance") contains within itself all that is necessary to give rise to thought. Given the right concatenation of factors, organic matter arises out of inorganic matter. And even the most primitive life-forms can evolve to produce thinking beings. There is not, as Descartes thought, an absolute dividing line separating organic from inorganic matter, or man from the animals. In all these ideas, Spinoza showed himself to be far in advance of his times.

Spinoza believed that mastery over nature and the improvement of man were the main purpose of the pursuit of knowledge. In the field of ethics and morality too, he defends very advanced ideas. He correctly understood that morality was relative:

"As for the terms good and bad, they also mean nothing positive in things considered in themselves, nor are they anything else than modes of thought, or notions, which we form from the comparison of things with each other. For one and the same thing can at the same time be good, bad, and indifferent. E.g., music is good to the melancholy, bad to those who mourn, and neither good nor bad to the deaf. Although this be so, these words

must be retained by us." (Spinoza, Ethics, p. 141.)

He rejected the idea of free will, and instead advocated a thoroughly determinist position. There are no "free" actions, in the sense that all actions are caused by something, whether we are aware of it or not. Spinoza was the first one to give a dialectical appraisal of the relation between freedom and necessity, when he pointed out that real freedom consists in the understanding of necessity. True freedom does not consist in denying the existence of the objective laws of nature, but in striving to understand them, in order to gain mastery over them.

He opposed prejudice and superstition wherever he found them, and long before the French Enlightenment, decided to summon all prejudices to the "court of reason." For those who take refuge in the will of God, "the asylum of ignorance," he has nothing but contempt. In the following passage, he was undoubtedly speaking from painful personal experience:

"Thus again, when they see the human body they are amazed, and as they know not the cause of so much art, they conclude that it was made not by mechanical art, but divine or supernatural art, and constructed in such a manner that one part does not injure another. And hence it comes about that someone who wishes to seek out the true causes of miracles, and to understand the things of nature like a man of learning, and not stare at them in amazement like a fool, is widely deemed heretical and impious, and proclaimed such by those whom the mob adore as the interpreters of nature and the Gods." (Ibid., p. 34-5.)

The basic idea of Spinoza’s philosophy is monism—the idea that all things are one. All the myriad forms of existence, the shapes, colours, forms of movement, are only different expressions of the same Substance, which can assume an infinite variety of forms. These accidental, temporary phenomena he calls "modi" (singular, modus). They are the the forms which matter assumes, continually coming into being and disappearing, like the restless waves on a mighty ocean. But these transitory forms of being can have no separate existence, independent from Substance, unbounded and eternal, which, operating according to its own laws, must give rise to an unlimited number of particular, finite forms. These forms, in turn, are not free agents, but subject to natural laws which determine the existence of all things. Through the agency of reason, it is possible to understand these laws and thereby achieve freedom consciously to determine our actions and comprehend our true place in the universe.

This imposing philosophy is in complete accord with the discoveries of modern science. All the endless forms of organic and inorganic matter we see in the universe can be reduced to the same substance—molecules, atoms and sub-atomic particles. According to the latest theories, a small number of quarks are put together in different ways to make hundreds of hadrons, which combine to form the nuclei of a hundred or so chemical elements. Together with leptons, they then make up atoms, which then combine to make molecules, out of which everything else is built. The same material substance therefore underlies all the forms of being in the universe. Of course, this picture is much more complicated than the one painted by Spinoza, who had only the scantiest information to go on. A long period of scientific advance was necessary before his picture of the

universe could be properly corroborated. But his hypothesis that everything comes from a common substance has been substantially vindicated.

The principle of monism can be interpreted either in a materialist or an idealist sense. Plato and Hegel were also monists, because they considered that the universe and everything in it was ultimately an expression of the "Absolute Idea." Marx and Engels were materialist monists. Spinoza's case is peculiar. While formally he has to be considered an idealist, there is an element of ambiguity about his Substance which is certainly open to a materialist interpretation. This was quickly grasped by his contemporaries, Jews and Christians alike, who accused him of atheism. All kinds of heinous crimes and immoral ideas were attributed to him. For a long time after his death his name could hardly be mentioned in polite society. The German writer Lessing said that, in his day, a century later, people treated Spinoza "like a dead dog."

Despite all the calumnies, Spinoza's philosophy stands as a monument to the great and noble spirit that conceived it. His philosophy, which came very close to materialism, inevitably led him to draw the most advanced social conclusions, in contrast to the reactionary misanthropy of Hume and Berkeley. This comes across clearly in the pages of his masterpiece, Ethics:

"Man is a God to man. Yet it rarely happens that men live under the guidance of reason, but among them things are in such a state that they are usually envious of or a nuisance to each other. But nevertheless they are scarcely able to lead a solitary life, so that to many the definition of man as a social animal has been very attractive; and in truth things are so ordered that from the common society of men far more conveniences arise than the contrary. Let satirists therefore laugh to their hearts' content at human affairs, let theologians revile them, and let the melancholy praise as much as they can the rude and uncultivated life: let them despise men and admire the brutes—despite all this, men will find by experience that they can procure with mutual aid far more easily what they need, and avoid far more easily the perils which beset them on all sides, by united forces: to say nothing of how much better it is, and more worthy of our knowledge, to regard the deeds of men rather than those of the brutes" (Ibid. p, 161-2.)

Leibniz

To see a World in a Grain of Sand
And a heaven in a Wild Flower,
Hold Infinity in the palm of your hand,
And Eternity in an hour.
(William Blake, Auguries of Innocence, 1)

The monist views of Spinoza were challenged by his great contemporary, Gottfried Leibniz (1646-1716), yet another encyclopaedic mind. Leibniz was a mathematician, physicist, geologist, biologist, diplomat, librarian, and historian. He invented the infinitesimal calculus, although Newton claimed to have done this earlier. In physics, he anticipated the law of preservation of energy. He is also considered to have been the founder of mathematical logic, although he did not publish his work on this subject.

An objective idealist, Leibniz nevertheless developed dialectics. In his Philosophical Notebooks, Lenin wrote that "Leibniz through theology arrived at the principle of the inseparable (and universal, absolute) connection of matter and motion." Marx also expressed his admiration for Leibniz (see Letter to Engels, 10 May 1870). The basis of Spinoza's philosophy was the single universal substance. Leibniz also starts from the notion of substance but defines it differently. He sees it like living activity, internal motion, and energy. The fundamental difference with Spinoza is that, where he stressed the singleness of being, Leibniz lays all the emphasis on the multiplicity of the universe. For him, the entire universe is composed of an infinite number of substances which he calls "monads." The monads of Leibniz are similar to the idea of atoms. Whilst in Paris, Leibniz met and was influenced by the materialist Gassendi who had revived interest in the atomistic philosophy of Democritus and Epicurus. For Leibniz, everything is made of monads, including ourselves. However, there are some peculiarities in this theory. To begin with, no monad is like another. Each is its own special world, impenetrable from without. Leibniz thought that no two things in the world were the same. Each monad (and there are infinite number of them) is also a microcosm, which reflects the universe at large. It is a kind of embryo of the totality of things. Thus, the particular contains the universal.

The entire universe is only the sum total of the monads. Everything is an aggregate of monads, even the human soul. Moreover, these monads are not dead matter, but centres of living activity, in constant movement and mutation. In many respects, this picture is a striking anticipation of the modern atomistic view of the universe. Probably, Leibniz got his idea from observations through a microscope. Thus, he compares bodies to a fish-pond in which the smallest drop of water is full of teeming life, although it cannot be said that the pond itself lives. Feuerbach compared Spinoza's philosophy to a telescope which makes objects visible to the human eye that are otherwise invisible because their remoteness, whereas that of Leibniz is like a microscope which makes objects visible that are unnoticeable because of their minuteness and fineness. The monad is like an individual cell which contains all the information required to construct an entire body. In the same way, Marx, in Capital, derives all the contradictions of capitalism from a single cell, the commodity.

Despite its idealistic form, there is here the germ of a profound idea and a dialectical concept of nature, based on movement, infinite connections, change and evolution from a lower to a higher stage. For example, he distinguishes between different levels of monads, from the lowest rank, analogous to the stage of inorganic nature, in which the life of the monads expresses itself only in the form of motion. There are higher stages, analogous to plants, animals, which culminates in the human soul. "Here is dialectics of a kind," commented Lenin, "and very profound, despite the idealism and clericalism." (Lenin, Collected Works, Vol. 38, p. 383.) What role does God have in relation to the monads? Not very much, it seems. Leibniz makes God the "sufficient reason" of all the monads. Feuerbach considered him to be only half a Christian, atheist, or a cross between a Christian and a naturalist. As Schwegler remarks: "It was a hard matter for Leibniz to bring—without abandoning the presuppositions of both—his monadology and his Theism into unison." (History of Philosophy, p. 198.)

Leibniz’s theory of knowledge is in opposition to the empiricism of Locke from the standpoint of objective idealism. Leibniz may be considered the father of German idealism. He is best known for his famous doctrine of "the best of all possible worlds," according to which it is impossible that it should be any more perfect world than that which exists. This must have been a comforting thought for the wealthy aristocrats for whom Leibniz worked. But from a philosophical standpoint, their satisfaction would not really be justified. For Leibniz, there are an infinite number of possible worlds, but only one has been chosen by God. In other words, the world we live in at this particular moment is the "best" one because it is the only one. However, the same Leibniz writes in his Monadology number 22:

"Every present state of a simple substance is the natural consequence of its preceding state, in such a way that its present is big with its future." (Leibniz, Discourse on Metaphysics and Other Writings, p. 256.) Leibniz’s dialectical philosophy, which echoes Heraclitus and anticipates Hegel, was far from defending the idea of an unchanging status quo, "because all bodies are in a state of perpetual flux like rivers, and the parts are continually entering in or passing out." (Leibniz, Ibid, p. 267.)

Kant

The German philosopher Immanuel Kant (1724-1804) marks the beginning of a turning point in philosophy. He was born in Königsberg, Prussia, where he spent most of his life. A liberal in politics, he was influenced by the ideas of Rousseau, and sympathised with the French Revolution, at least in the early stages. The other great influence on his thought was science, which at the time was making spectacular advances. Kant himself made an important contribution to science, particularly in his General Natural History and Theory of the Heavens (1755). In this, where he put forward the nebular hypothesis for the formation of the solar system, later developed by Laplace, and now generally accepted.

When Kant began his intellectual activity, German philosophy had reached a dead end. The brilliant flashes of inspiration that characterised the thought of Leibniz did not really add up to a coherent school of philosophy. After his death, Christian Wolff tried to turn it into a system, but succeeded only in vulgarising it. In Wolff’s hands, Leibniz’s profound intuitions about the world became transformed into the most arid formalism. Kant was repelled by this metaphysical speculation, which attempted to solve the mysteries of the universe, not by looking at nature, but by endless abstract reasoning. Meanwhile, in the real world, a new spirit was stirring. The natural sciences were developing fast, especially in Britain and France. Even in sleepy Germany, where the Thirsty Years’ War had paralysed progress, there was a renewal of culture in the AufklÖrung, the German equivalent of the French Enlightenment. Kant was the true child of his times.

His most important work, the Critique of Pure Reason, was first published in 1781, when he was 57 years old, although it was subsequently revised in the second edition in 1787. In this work, Kant attempts to resolve the problem of knowledge, which had caused a crisis in philosophy, the clearest expression of which was the subjective idealism of Berkeley and the scepticism of Hume. Kant’s declared aim was to finish off the old metaphysics which "appears to furnish an arena specially adapted for the display of skill

or the exercise of strength in mock-contests—a field in which no combatant ever yet succeeded in gaining an inch of ground, in which, at least, no victory was ever yet crowned with permanent possession." (Op. cit., p.11.)

The great successes of natural science, especially in Britain, meant that knowledge could not be confined to mere abstract speculation, which sucked its theories out of its thumb. Determined to break with this "metaphysics," Kant decided that it was necessary to go back to fundamentals. He decided to tackle the thorny question of how true knowledge was to be obtained. On the one hand, the striking advances of natural science pointed the way forward. All those questions about the nature of the universe and man's place in it could not be solved by abstract speculation, but only by observation and experiment.

The task of the sciences is not merely to collect a heap of facts. It is to obtain a rational insight into the workings of nature. For this, mere generalisations are insufficient. Thinking must not be passive but active, as Kant understood. It is not an accident that the title of his greatest work refers to Reason (Vernunft), which he clearly distinguishes from mere Understanding (Verstand). But are the forms of reason adequate to comprehend reality? Kant subjected these logical forms to a searching criticism, and showed that the traditional logic falls into a state of contradiction (antimony). Kant showed that it was possible to derived diametrically opposite conclusions from the same propositions. But in Kant, this contradiction remains unresolved.

Kant's Theory of Knowledge

The relation of subject-object was a central question in philosophy for centuries. To simplify things, the mechanical materialists laid all the stress on the object (material reality, nature), leaving no role for the thinking subject, which was portrayed as a passive receptacle (tabula rasa), whereas the idealists laid all the stress on the subject (mind, the Idea, etc.).

Kant asks what we can know, and how we can know it. This is one of the central questions of philosophy—the theory of knowledge or cognition ("epistemology"). We derive the greater part of our knowledge from observing the real world. From an early age, we see things, we listen, we touch, and so on. Gradually, we build up a picture of the world in which we live. This kind of knowledge is the knowledge of sense-perception. For empiricists like Locke, there is no other kind. Here Kant disagrees. In getting to know the world, the mind is not merely an empty vessel, which can be filled with any content (Locke described it as a tabula rasa—a blank slate). For Kant, the act of cognition is not passive, but active. We do not simply make a list of the things we see, but consciously select, order and interpret them. For this, the mind has its own method and rules. There are forms of thought wh_ch we apply, consciously or unconsciously, when we attempt to understand the information provided by our senses ("sense data").

Kant argues that there are two kinds of knowledge. While most knowledge is derived from experience, part of our knowledge is a priori, and not derived from experience. In Kant's opinion, we can only know what is given to us in sense experience. However, the things in themselves, which cause our sensations, cannot be known. Here, Kant is skating on thin ice. Although he denied it, these views seem to be similar to the subjective

idealism of Hume and Berkeley. Kant changed some of his formulations in the second edition, precisely to avoid this conclusion. In the first edition, he implied that the thinking subject might be the same thing as the object which it perceives. Later, he changed this, maintaining that things outside ourselves certainly exist, but they manifest themselves to us only in appearance, not as they are in themselves.

According to Kant, there are some ideas which are not derived from sense-perception. This shows the difference between the philosophy of Kant and that of Locke, who held that all knowledge whatsoever came from the senses. By contrast, Kant claimed that some knowledge was inborn, namely, the knowledge of space and time. If we make abstraction from all physical aspects of phenomena, he says, we are left with just two things—time and space. Now time and space, together with motion, are the most general and fundamental properties of matter. The only way that it is possible to understand them is in relation to material things. But Kant was an idealist. He insisted that the notions of time and space were inborn. They did not come from experience, but were what he called a priori (from the Latin meaning "from the beginning").

To support his idea that space and time are a priori phenomena, Kant uses a very peculiar mode of reasoning. He maintains that, whereas it is impossible to think of objects without time, it is quite possible to think of time without objects; the same in relation to space. In point of fact, space and time are inseparable from matter, and it is impossible to conceive of them as "things in themselves."

Kant states that it is possible to imagine space with nothing in it, but impossible to imagine no space. But this is not so. Space without matter is just as much an empty abstraction as matter without space. In point of fact, time, space and motion are the mode of existence of matter, and can be conceived of in no other way. Kant’s idea that time and space are outside the range of sense-experience has been refuted by the discoveries of non-Euclidian geometry.

In Anti Dühring, Engels shows that the whole concept of a priori knowledge is false. All ideas are ultimately derived from reality, even the axioms of mathematics. It is true that, if we leave aside all the material qualities of a thing, all that is left is space and time. However, these are now empty abstractions. They cannot stand on their own, any more than there can be fruit, without apples, pears, oranges etc.; or humanity, without human beings, and so on. The only difference is that the idea of fruit, or humanity, are abstractions of a particular kind of matter, whereas time and space are the most general features, or, more correctly, the mode of existence, of matter in general.

The Thing-in-Itself

All human knowledge (cognition) is the product of two factors—the cognising subject and the cognised object. The raw material of knowledge is provided by the external object (the physical world), whereas the subject (the thinking mind) gives form and meaning to the information of the senses. Kant, unlike Berkeley, accepts the existence of an external world, without which there would be no possibility of knowledge, or experience. Nevertheless, Kant denies that it is possible to know things as they are in "themselves." We can only know appearances. His fundamental mistake was not to see

the relation between appearance and essence. It it wrong to think that we can only know "appearances." When I know the property of the thing, I know the thing itself. There is nothing else to know; no "beyond," no Thing-in-Itself.

Now it had been the conviction of every age that the only way of getting to know a thing was precisely by taking the material given to us by our senses, and analysing it by means of reflection. This, and nothing else, is the process of cognition. Here, for the first time, we are confronted with the assertion that there is some kind of difference between what we can see and experience and the "real" nature of things. This is a most peculiar notion, and one which runs counter to all human experience. It therefore demands a very clear justification. But the fact is that Kant does not justify it at all. He merely asserts it in a dogmatic manner, which is the opposite of what he set out to do.

"It marks the diseased state of the age," remarks Hegel, "when we see it adopting the despairing creed that our knowledge is only subjective, and that beyond this subjective we cannot go." (Hegel, Logic, p. 35.) Hegel, like Kant, was an idealist, but he was an objective idealist, who never denied that it was possible to know the real world. Such objective idealism is far superior, with all its faults, to the complete confusionism which comes from subjective idealism. It is therefore not surprising that in the "diseased state" of our own age, it is Kant, not Hegel who has found most favour with philosophers and scientists, who wish to convince us that we cannot really assert that the physical world exists, or that we cannot know what happened before the "big bang" (and must not ask), or that the behaviour of sub-atomic particles depends exclusively on whether we are present to observe them.

Against this, we agree a hundred times with Hegel when he says that "everything we know both of outward and inward nature, in one word, the objective world, is in its own self the same as it is in thought, and that to think is to bring out the truth of our object, be it what it may. The business of philosophy is only to bring into explicit consciousness what the world in all ages has believed about thought. Philosophy therefore advances nothing new; and our present discussion has led us to a conclusion which agrees with the natural belief of mankind." (Hegel, Logic, p. 35.)

Evidently, at any given moment in time, we cannot know everything about a phenomenon. Truth is as infinite as the universe itself. But the entire history of human thought is characterised by a constant movement from ignorance to knowledge. What we do not know today, we will discover tomorrow. Therefore, it is a serious mistake to confuse what is not known with what cannot be known. Kant’s Thing-in-Itself is merely a way of indicating our present limitations. It is not a mystery, but a problem to be solved. What is today a Thing-in-Itself will tomorrow be a Thing-for-Us. This is the message of the whole history of thought in general, and science in particular.

In reality, the Thing-in-Itself is an empty abstraction. If we take away all the properties of an object which are knowable, we are left with precisely nothing. As J. N. Findlay, echoing Hegel, correctly observes: "The Thing-in-Itself, which Kant holds to be unknowable is really the most completely knowable of all abstractions; it is what we get when we deliberately leave out all empirical content and every vestige of categorical structure." (Foreword to Hegel’s Logic, p. xii.) There is a fundamental difference

between what is not known and what is unknowable. Kant here slides into agnosticism, the impotent doctrine that says that there are certain things which cannot be known, and therefore, that there are certain questions which cannot be asked. Findlay is harsh but not unjust when he concludes that "Kant, in short, is in a permanent philosophical muddle, and never knows where he has got to nor where he is going." (Ibid., p. xiv.) The notion of the unknowable Thing-in-Itself is undoubtedly the weakest part of Kant's philosophy, and for that very reason is practically the only bit which has been taken over by the modern philosophers and scientists.

The source of Kant's error was to regard appearance and essence as two mutually exclusive things. Thought, instead of being seen as as a bridge uniting the thinking subject with the world, is conceived of as a barrier, something standing between the subject and the object. Kant conceives of thought as an instrument which we use to understand the world. This is an unsatisfactory formulation, as Hegel explains:

"A main line of argument in the Critical (i.e., Kantian) Philosophy bids us pause before proceeding to inquire into God or into the true being of things, and tells us first of all to examine the faculty of cognition and see whether it is equal to such an effort. We ought, says Kant, to become acquainted with the instrument, before we undertake the work for which it is to be employed; for if the instrument be insufficient, all our trouble will be spent in vain. The plausibility of this suggestion has won for it general assent and admiration; the result of which has been to withdraw cognition from an interest in its objects and absorption in the study of them, and to direct it back upon itself; and so turn it to a question of form." (Hegel, Logic, p. 14)

Hegel points out that thought is not an "instrument", like a tool which can be examined before commencing a job. We would be faced with the paradox that the "tool" would have to examine itself, since thought can only be examined by thinking. To seek to know before we know is like the conduct of a man who refuses to go into the water until he has learnt how to swim. Men and women thought long before logic was ever conceived. In point of fact, the forms of thought, including logic, are the product of a very long period of human development, both mental and practical. The objects of the physical world are immediately given to us in sense-perception. But the matter does not stop there. The understanding gets to work on the information given to it by the senses. It is analysed, broken down into its parts. This is known as mediation in philosophy.

Marx's son-in-law, the French socialist Paul Lafargue, very wittily explains the practical consequences of the theory of the Thing-in-Itself:

"The workingman who eats sausage and receives a hundred sous a day knows very well that he is robbed by the employer and is nourished by pork meat, that the employer is a robber and that the sausage is pleasant to the taste and nourishing to the body. Not at all, say the bourgeois sophists, whether they are called Pyrrho, Hume or Kant. His opinion is personal, an entirely subjective opinion; he might with equal reason maintain that the employer is his benefactor and that the sausage consists of chopped leather, for he cannot know things-in-themselves.

"The question is not properly put, that is the whole trouble...In order to know an object,

man must first verify whether his senses deceive him or not...The chemists have gone deeper—they have penetrated into bodies, they have analysed them, decomposed them into their elements, and then performed the reverse procedure, they have recomposed them from their elements. And from the moment that man is able to produce things for his own use from these elements, he may, as Engels says, assert that he knows the things-in-themselves. The God of the Christians, if he existed and if he had created the world, could do no more." (Paul Lafargue, Le MatŽrialisme de Marx et l'IdŽalisme de Kant, in Le Socialiste, February 25, 1900.)

Despite his undoubted genius, Kant did a disservice to philosophy and science by implicitly placing a limit on human knowledge. The theory of the unknowable, that part of Kant's philosophy which should have been allowed to quietly sink without trace, is precisely the one thing of Kant which has been taken over in the 20th century by those, like Heisenberg, who wish to introduce mysticism into science. While Kant attempted a critique of the forms of logic (this was his great merit), he displayed a certain inconsistency, for example, in accepting the law of contradiction. This led him into new problems.

The Forms of Logic

The most important aspect of the Critique of Pure Reason is Kant's criticism of logic:

"That Logic has advanced in this sure course, even from the earliest times, is apparent from the fact that, since Aristotle, it has been unable to advance a step, and thus to all appearance has reached its completion." (Kant, Critique of Pure Reason, p. 8).

An important part of Kant's inquiry concerns the nature of thought-forms in general, and particularly the the forms of logic. Where do they come from? What do they represent? How far do they reflect the truth? It was to Kant's credit that he asked these questions, although he did not provide an adequate answer, being content to leave that to his successors. This question really goes to the heart of the fundamental question of all philosophy—the relation between thought and being, between mind and matter. Like Hegel, Kant had a very poor opinion of formal logic, a "specious art...which gives to all our cognitions the form of understanding." (Critique, p.68) Kant was the first one to distinguish between Understanding (Verstand) and Reason (Vernunf). Understanding is the lowest form of rational thinking. It takes things as they are, and merely registers the bare fact of existence. This is the basis of formal logic, and also "common sense" which takes things to be just as they seem.

The process of thinking does not stop at the level of understanding, that is, the mere registering of facts. Reason goes beyond what is immediately given to our eyes and ears, breaks it down into its constituent parts, and puts it together again. This is the role of the Dialectic. Up until Kant, the art of dialectics had been virtually forgotten. It was regarded as mere trickery and sophism, the "logic of illusion". It was Kant's great achievement to restore dialectics to its rightful place in philosophy, as a higher form of logic.

Kant attempts to put human knowledge on a sound basis, by insisting that it must be based upon experience. However, this is insufficient. Initially in the process of cognition,

we are confronted with a confused mass of data, with no logical thread or necessary connection. This would not be generally thought of as real knowledge, still less scientific knowledge. We expect something more. In order to make sense of the information provided by the senses, it is necessary for reason to be active, not merely passive:

"They (the natural scientists) learned that reason only perceives that which it produces after its own design; that it must not be content to follow, as it were, in the leading-strings of nature, but must proceed in advance with principles of judgment according to unvarying laws, and compel nature to reply to its questions. For accidental observations, made according to no preconceived plan, cannot be united under a necessary law. But it is this that reason seeks for and requires. It is only the principles of reason which can give to concordant phenomena the validity of laws, and it is only when experiment is directed by these rational principles that it can have any real utility. Reason must approach nature with the view, indeed, of receiving information from it, not, however, in the character of a pupil, who listens to all that his master chooses to tell him, but in that of a judge, who compels the witnesses to reply to those questions which he himself thinks fit to propose." (Kant, Critique of Pure Reason, pp. 10-11.)

There is an important difference between the way that Kant and Aristotle understood the laws of logic. For Aristotle, these were laws of things, whereas, for the idealist Kant, they are laws of thought only. The nub of the matter is that, for Kant, the Law of Identity, for example cannot be found in the objects themselves. It is merely applied to them by consciousness. Thus, for Kant, logic is only a convenient method for ordering and classifying things, whereas dialectics derives its laws from the real world, and applies them back again. This mistaken conception of Kant has been carried over into modern logic and mathematics, where it is often asserted that laws, theorems, etc., are only formal ideas which are used for the sake of convenience, but which have no real relation to the objective world.

The "Antimonies"

The most interesting part of the Critique of Pure Reason is known as the antimonies. In these, Kant shows the contradictions that exist in thought. Thus, starting with the laws of formal logic, and applying them to the world of experience, Kant precedes to show the contradictions which arise. Kant takes this as proof of the unknownability of the Thing-in-Itself, instead of seeing that the contradictions are objective, and present in the phenomena themselves.

The fundamental problem here is: How do the forms of logic relate to the real world? The categories of formal logic tell us absolutely nothing about the real world. It was the task of science to discover the laws of the real world through observation and experiment. However, the picture of the world was never complete, since science would inevitably discover new fields all the time, and would have to constantly readjust its theories and propositions. This is the real process. However, Kant drew entirely different conclusions.

Not until Hegel was the reason for these contradictions explained. The problem arises from the nature of formal logic itself, which takes opposites to be mutually exclusive. For example, the logical category of identity presupposes its opposite—difference. When we

say that something is, we think we have identified it. However, it only has identity in comparison to other things. John is John, because he is not Peter, Paul, etc. Thus, identity presupposes difference, and has no meaning in isolation. In general, things have no meaning unless taken together with their opposites. Life cannot be understood without death. North and South, right and left, male and female, good and bad, can only have meaning in relation to their opposites. The unity of opposites is a fundamental fact of existence.

Hegel later explained that pure, undifferentiated being is the same as nothing. If we merely confine ourselves to the assertion that a thing is, without explaining its concrete properties, internal contradictions, motion and change, and manifold relations, we do not really grasp the truth about it. Without further concretisation, simple being turns out to be an empty abstraction. This particular contradiction ("antimony") can only be resolved by understanding that being and not being are not mutually exclusive, but are combined in the process of becoming.

Similarly, the polar opposites cause and effect have to be united as interaction. If we attempt to isolate a particular cause and effect, immediately land ourselves in a contradiction, since there are always an infinite number of causes which precede the given case; in fact, behind each isolated fact is the whole history of the universe. Similarly, if we attempt to understand a particular fact as a cause, we will enter into an endless chain of phenomena, following it in time, into infinity.

How to solve this contradiction? If we keep within the rules of formal logic, the only solution to Kant’s antimonies, is to deny the validity of exactly one half of its categories, recognising only the other half. The mediaeval Schoolmen, for example, declared that chance (accident) to be a purely subjective concept, a product of ignorance of the causes. Everything in the universe was absolutely determined, in fact, preordained from the beginning to the end by the Supreme Being. Likewise, Identity was proclaimed to be absolute, and Contradiction rigorously prohibited by the traditional logic.

Kant points out in the section on the antimonies that contradiction is not just a trick of sophists, but is inevitable. The antimonies, where he gives two sets of proofs for two contrary propositions, are "not mere sophistries—are not fallacious, but grounded on the nature of reason..." (Ibid, p. 304). For example, in cosmology, which he was deeply interested in, such questions as whether the universe has a beginning or not.

"Unfortunately for speculation—but perhaps fortunately for the practical interests of humanity—reason, in the midst of her highest anticipations, finds herself hemmed in by a press of opposite and contradictory conclusions, from which neither her honour nor her safety will permit her to draw back. Nor can she regard these conflicting trains of reasoning with indifference as mere passages at arms, still less can she command peace; for in the subject of the conflict she has a deep interest. There is no other course left open to her, than to reflect with herself upon the origin of this disunion in reason—whether it may not arise from a mere misunderstanding. After such an inquiry, arrogant claims would have to be given up on both sides; but the sovereignty of reason over understanding and sense would be based upon a sure foundation." (Ibid, p. 282.)

The real resolution is the never-ending process of deepening knowledge:

"For it (reason) can give no answer to our question respecting the conditions of its synthesis—except such as must be supplemented by another question, and so on to infinity. According to it, we must rise from a given beginning to one still higher; every part conducts us to a still smaller one; every event is preceded by another event which is its cause; and the conditions of existence rest always upon other and still higher conditions, and find neither end nor basis in some self-subsistent thing as the primal being." (Ibid, p. 284.)

Every answer only gives rise to a new question, and so on ad infinitum. There are no final answers. No end to the process. Therefore, dialectical thought is undogmatic and open-ended. The solution to the supposedly "unsolvable" problems is given by the never-ending process of the history of science and human thought in general. The only way of resolving the contradictions in thought was by a complete overhaul of logic, breaking down the old rigid schemas, which did not and could not faithfully reflect the reality of a moving, changing, living, contradictory world. Hegel hailed Kant for reintroducing the notion of contradiction into logic.

"And to offer the idea that the contradiction introduced into the world of Reason by the categories of Understanding is inevitable and essential was one of the most important steps in the progress of Modern Philosophy." (Hegel, Logic, p. 77). However, having posed the question, Kant was unable or unwilling to provide the answer. "But the more important the issue thus raised, the more trivial was the solution." (ibid).

Kant did not achieve this revolution. But his great merit was to point the way forward. Kant gave philosophy a new lease of life, by subjecting the old forms of thought to a thorough criticism, revealing their inherently unsatisfactory and contradictory nature The Critique of Pure Reason showed that contradictions were inherent in thinking. In so doing, Kant reintroduced dialectics into philosophy. Hitherto, dialectics was regarded as a purely subjective method of reasoning. Kant showed that dialectics was neither arbitrary nor subjective, but an entirely valid method of reasoning.

Revolutionary though it was for its time, Kant’s philosophy cannot be regarded as a satisfactory solution to the problems posed by it. More than anything, Kant’s dialectic resembles the old Socratic dialectic of discussion. There is some merit in this. The struggle between opposed conceptions, in which due weight is given to the arguments of the other side, and arguments are put forward for and against in a rigorous way, can lead to a general increase in awareness of the questions involved. Yet there is something unsatisfactory about it; a kind of agnosticism; the superficial idea that "the truth is never all on one side," and so forth.

Kant’s antimonies are only four in number. It was left to Hegel to point out that, in fact everything contains an "antimony" (contradiction):

"That true and positive meaning of the antimonies is this: that every actual thing involves a coexistence of opposed elements. Consequently to know, or, in other words, to comprehend an object is equivalent to being conscious of it as a concrete unity of

opposed determinations." (Ibid, p. 78.)

Kant’s merit was to submit the traditional forms of logic to a thoroughgoing criticism. His defect lay in his subjectivist position on the theory of knowledge. This was the source of his main weaknesses— ambiguity, inconsistency and agnosticism. In failing to make a clean break with the traditional logic, while exposing its limitations, Kant landed himself in all kinds of insoluble contradictions (antimonies), which he left unresolved. The problem of the relation between subject and object (thought and being) was only finally resolved by Marx and Engels, who pointed out that, ultimately, all the problems of philosophy are resolved in practice:

"Social life is essentially practical. All mysteries which mislead theory to mysticism find their rational solution in human practice and in the comprehension of this practice." (MESW,Theses on Feuerbach, no. 8, Vol. 1, p. 15.)

Hegel’s Revolution in Philosophy

"For the rest it is not difficult to see that our epoch is a birth-time, and a period of transition. The spirit of man has broken with the old order of things hitherto prevailing, and with the old ways of thinking, and is in the mind to let them sink into the depths of the past and to set about its own transformation. It is indeed never at rest, but carried along the stream of progress ever onward. But it is here as in the case of the birth of a child; after a long period of nutrition in silence, the continuity of the gradual growth in size, of quantitative change, is suddenly cut short by the first breath drawn—there is a break in the process, a qualitative change—and the child is born. In like manner the spirit of the time, growing slowly and quietly ripe for the new form it is to assume, disintegrates one fragment after another of the structure of its previous world. That it is tottering to its fall is indicated only by symptoms here and there. Frivolity and again ennui, which are spreading in the established order of things, the undefined foreboding of something unknown—all these betoken that there is something else approaching. The gradual crumbling to pieces, which did not alter the general look and aspect of the whole, is interrupted by the sunrise, which, in a flash and at a single stroke, brings into view the form and structure of the new world." (Hegel, The Phenomenology of Mind, p. 75.)

Hegel’s "Voyage of Discovery"

Georg Wilhelm Friedrich Hegel was born in Stuttgart in 1770. In his youth he was a follower, and then a collaborator of Schelling, whose radical views gained him a certain notoriety, until he made his peace with the Prussian authorities in later life. But Hegel soon moved on from his early efforts. Hegel’s original contribution to philosophy begins in 1807 with the publication of The Phenomenology of Mind. The period under consideration was one of storm and stress. France had erupted in revolution when he was a nineteen year old student. The French Revolution, and the Napoleonic wars set an indelible stamp on the entire epoch. In Hegel’s own words, the "composition of the book was concluded at mid-night before the battle of Jena."

This work, which Hegel describes as his "Voyage of discovery" was received with coldness and dissatisfaction by those who had previously been his teachers and friends.

The Phenomenology traces the development of thought through all its phases, proceeding from the lowest, most general, and abstract to the highest form which he calls the Notion. Each form of knowledge is examined within his own conditions and limits, bringing out its dialectical relation to other forms of thought. The importance of philosophy is that it alone must consider and justify its own conceptions, unlike mathematics, which proceeds from given axioms which are accepted uncritically. Philosophy presupposes nothing, not even itself.

For the modern reader, the writings of Hegel present considerable difficulties. "Abstract and abstruse," Engels called them. This is certainly true of The Phenomenology. At times, one has the impression that Hegel is being deliberately obscure, that he is challenging the reader to penetrate the complex and difficult edifice of dialectical thought. A large part of the difficulty, in fact, stems from the fact that Hegel was an idealist, and that, therefore, the dialectic appears here in a mystified form. The Phenomenology is a good example of this.

Here historical development appears in a idealistic fashion, as the development of self conscience mind (or spirit). Nevertheless, it is possible to read Hegel, as Marx did, from a materialist point of view, bringing out the rational kernel of his thought. In The Phenomenology "self consciousness" reveals its activity in many ways, through sensation and perception, as well as through ideas. In all this, it is possible to perceive the dim outline of real processes that take place in nature, society, and the human mind. In contrast with previous idealist philosophies, Hegel displayed a lively interest in the facts of nature, human nature, and human history. Behind his abstract presentation, there lies a wealth of knowledge of all aspects of history, philosophy and contemporary science. Marx described him as "the most encyclopaedic mind of the day."

Behind the "abstract and abstruse" language, once the idealist mystification is stripped away, we see before us a full-fledged revolution in human thought. The Russian radical democrat Herzen referred to the Hegelian dialectic as "the algebra of revolution." In an algebraic equation it is necessary to fill in the missing quantities. This was later achieved by Marx and Engels, who rescued the rational kernel of Hegel’s philosophy after his death, and, by placing it on a materialist basis, gave it a scientific character. Commenting on Hegel’s philosophy, Engels writes:

"This new German philosophy terminated in the Hegelian system. In this system—and this is its great merit—the whole world, natural, historical, intellectual, is for the first time represented as a process, i.e., as in constant motion, change, transformation, development; and the attempt was made to show internal interconnections in this motion and development. From this point of view the history of mankind no longer appeared as a wild whirl of senseless deeds of violence, all equally condemnable at the judgement-seat of mature philosophic reason and best forgotten as quickly as possible, but as the process of evolution of humanity itself. It was now the task of the intellect to follow the gradual march of this process through all its devious ways, and to trace out the inner logic running through all its apparently contingent phenomena." (Engels, Anti-Dühring, p. 29.)

Hegel Today

Hegel was a genius who was far ahead of his time. Unfortunately, the level of the natural sciences at the beginning of the 19th century did not furnish enough information to allow him to apply his revolutionary new method to full effect, although he had some brilliant insights, as Ilya Prigogine has pointed out. Engels applied this method to science in The Dialectics of Nature, a masterpiece of dialectical writing. But in our own time, science has furnished a wealth of material which shows the correctness of Hegel's fundamental ideas. It is a tragedy that the 20th century lacked a Hegel to provide the necessary insights into these great discoveries.

Nowadays, many scientists adopt a contemptuous attitude towards philosophy, which they regard as superfluous to their requirements. They consider that the actual progress made by science places them far above philosophy. In reality, however, they are far below philosophy at its most primitive level. It is said that nature abhors a vacuum. In the absence of a consistent and worked-out philosophy, they fall pray to all kind of prejudices and false ideas which they unconsciously imbibe from the prevailing tendencies and mood in society in which they live. This flotsam and jetsam, together with a few confused recollections of bad philosophy they picked up at university, provide the sum total of the intellectual baggage of many supposedly educated persons, including scientists. As Hegel humorously observed, these are "held to be a good substitute for real philosophy, much in the way that chicory is lauded as a substitute for coffee." (Phenomenology, p. 126.)

For most of this century, Hegel has been sadly neglected. The dominant school of Western philosophy, logical positivism, which was born partly as a reaction against Hegelianism, has treated Hegel rather as extreme Protestants treat the Pope of Rome. In turn, the views of this philosophical sect has influenced many scientists. One of the very few modern scientists in the West who has been prepared to give Hegel his due is the Belgian Ilya Prigogine, who has developed the theory of chaos and complexity, a line of thinking which has much in common with dialectics. It is a very simple matter to dismiss Hegel (or Engels) because their writings on science were necessarily limited by the actual state of science of the day. What is remarkable, however, is how advanced Hegel's views on science actually were.

In their book Order out of Chaos, Prigogine and Stengers point out that Hegel rejected the mechanistic method of classical Newtonian physics, at a time when Newton's ideas were universally sacrosanct:

"The Hegelian philosophy of nature," write Prigogine and Stengers, "systematically incorporates all that is denied by Newtonian science. In particular, it rests on the qualitative difference between the simple behaviour described by mechanics and the behaviour of more complex entities such as living beings. It denies the possibility of reducing those levels, rejecting the idea that differences are merely apparent and that nature is basically homogeneous and simple. It affirms the existence of a hierarchy, each level of which presupposes the preceding ones." (Op. cit., p. 89.)

Prigogine and Stengers refer to the unjust neglect from which Hegel has suffered, precisely at a time when his criticisms of Newtonian mechanism had been shown to be correct:

"In a sense Hegel's system provides a consistent philosophic response to the crucial problems of time and complexity. However, for generations of scientists it represented the epitome of abhorrence and contempt. In a few years, the intrinsic difficulties of Hegel's philosophy of nature were aggravated by the obsolescence of the scientific background on which his system was based, for Hegel, of course, based his rejection of the Newtonian system on the scientific conceptions of his time. And it was precisely those conceptions that were to fall into oblivion with astonishing speed. It is difficult to imagine a less opportune time than the beginning of the nineteenth century for seeking experimental and theoretical support for an alternative to classical science. Although this time was characterised by a remarkable extension of the experimental scope of science and by a proliferation of theories that seemed to contradict Newtonian science, most of those theories had to be given up only a few years after their appearance." (Ibid., p. 90.)

There are only a couple of things that need to be added to this. Firstly, what was valuable in Hegel's philosophy was not his system, but the dialectical method. Part of the reason why Hegel's writings are obscure is precisely that he tried to force the dialectic—which he developed brilliantly—into the straitjacket of an arbitrary idealist philosophical system. When it did not fit, he resorted to all manner of subterfuges and peculiar modes of reasoning which make the whole thing extremely convoluted and obscure.

However, we are firmly convinced that the main reason for the shameful conspiracy against Hegel has nothing to do with the obscurity of his style. That did not worry the university professors a hundred years ago. Moreover, the obscurity of Hegel is nothing compared to the senseless linguistic meanderings of the logical positivists, who are held up as models of "coherent thought," though nobody quite knows why. No, the real reason why Hegel became converted into a non-person is because it was realised that his dialectical philosophy was the point of departure for the revolutionary ideas of Marx and Engels. Poor old Hegel, conservative that he was in real life, has been tried in his absence and found guilty by association.

The fear of Hegel's ideas is neither accidental nor mistaken. Even in the 19th century, the danger posed by the dialectic was clear to some. James Stirling, a prominent English "Hegelian" wrote in 1867:

"This dialectic, it appears to me, has led to much that is equivocal both in Hegel and in others, and may become a pest yet." (Note to Schwegler's History of Philosophy, p. 415.)

Even during his lifetime, the revolutionary implications of Hegel's philosophy began to disturb the Prussian authorities. The defeat of the French in 1815 ushered in a period of reaction all over Europe. The so-called Carlsbad decrees of 1819 subjected the universities in all areas under Prussian jurisdiction to inquisitorial control. The slightest non-conformity was looked upon as subversion. A stifling atmosphere of petty provincialism prevailed in the lands of the "cabbage Junkers," as Marx later ironically called the Prussian feudal aristocrats.

In Berlin, where Hegel taught at the university, spiteful rumours were put in circulation by Hegel's enemies that his ideas were un-Christian, or even downright atheism. From then on he was a marked man. Attacked by both Rationalists and Evangelicals, Hegel

defended himself vigorously, pointing out that "all speculative philosophy on religion may be carried to atheism; all depends on who carries it; the particular piety of our times, and the malevolence of demagogues who will not let us want carriers." (Hegel, Logic, p. xxxix.)

Such was the atmosphere of persecution that Hegel even considered moving to Belgium, as Marx later did. In 1827 he wrote a letter to his wife commenting that he had looked at the universities of Liege and Louvain with the feeling that they might one day provide him a resting-place, "when the parsons in Berlin make the Kupfergraben completely intolerable for him." (ibid.) "The Roman Curia," he added, "would be a more honourable opponent than the miserable cabals of a miserable boiling of parsons in Berlin." (ibid.) It is ironical that at the end of his life, the conservative and religious Hegel should be regarded as a dangerous radical. Yet there was more than a grain of truth behind the suspicions of the reactionaries. Hidden within the philosophy of Hegel was the germ of a revolutionary idea, which would transform the world. This, in itself, constitutes the most remarkable example of a dialectical contradiction!

In his History of Philosophy Hegel revealed the hidden dialectical relationship between different schools of thought, showing how different theories revealed different aspects of the truth, which do not so much contradict, as complement and complete one another. In the Encyclopaedia of the Philosophical Sciences, Hegel likewise attempts to show the whole of science as an integrally collective whole. It is not merely a collection of sciences or a dictionary of philosophical knowledge but science presented as a dialectically interrelated totality. This is a very modern conception.

Hegel did not set out to deny or demolish previous philosophy, but to summarise all previous schools of thought, and arrive at a dialectical synthesis. But in so doing, he pushed philosophy to its limits. Beyond this point, it was impossible to develop philosophy, without transforming it into something different. It is possible to say that, since Hegel, nothing new has really been said on the main philosophical questions. Subsequent schools of philosophy, which purport to be new and original merely rehash old ideas, invariably in a more superficial and unsatisfactory manner. The only real revolution in philosophy since Hegel was the one effected by Marx and Engels, which passes beyond the limits of philosophy as a merely intellectual exercise, and carries it into the realm of practice and the struggle to change society.

Hegel says in The History of Philosophy that "the being of mind is its act, and its act is to be aware of itself." But in Hegel, thinking is not merely a contemplative activity. The highest form of thought, reason, does not merely accept the given facts, but works upon them and transform them. The contradiction between thought and being, between "subject" and "object," is overcome in Hegel through the process of knowledge itself, which penetrates ever deeper into the objective world. From a materialist point of view, however, thinking is not a isolated activity, but is inseparable from human existence in general. Mankind develops thought through concrete, sensuous activity, not merely intellectual activity. By transforming the material world through labour, man and women also transforms themselves, and, in so doing, develop and extend the horizon of their thinking. In embryo, the elements of this dialectical conception is already present in Hegel. What Marx did was to strip it of its idealist disguise, and expresses it in a clear

and scientific manner.

Theory of Knowledge

As we have seen, the fundamental problem of philosophy is the relation between thought and being. What is the relation between consciousness (knowledge) and the objective world? Kant claimed that there was an unbridgeable gap between the thinking subject and the unknowable Thing-in-Itself. Hegel poses the question differently. The process of thinking is the unity of subject and object. Thought is not a barrier separating man from the objective world, but, on the contrary, is a process linking ("mediating") the two. Taking as its starting point the reality immediately given in sense perception, human thought does not merely passively accept, as Locke imagined, but sets to work, transforming this information, breaking it down into its component parts, and putting it together again. Man uses rational thought to go beyond immediate reality. Dialectical thought, in analysing a given phenomenon, divides it into its component parts and demonstrates those contradictory features and tendencies which give it life and movement.

Scientific knowledge does not consist of a mere catalogue of particular items. If we say "all animals," that is not yet zoology. Above and beyond the facts, it is necessary to discover laws and objectives processes. It is necessary to uncover the objective relations between things, and explain the transitions between one state and the other. The history of science, like that of philosophy, is a permanent process of affirmation and negation, a ceaseless process and development, in which one idea negates another, and, in its turn, is negated in a never-ending process of deepening man’s knowledge of himself and the universe. A similar phenomenon may be seen in the mental development of the infant.

Hegel’s great merit was to show the dialectical character of the development of human thought, from its embryonic phase, passing through a whole series of stages, and finally arriving at the highest stage of reason, the Notion. In Hegelian language, it is the process from being "in itself" to being "in and for itself," that is to say, from undeveloped, implicit being to developed and explicit being. The human embryo, is, potentially, a human being, but it is not a human being in and for itself. In order to realise its full potential, a whole period of development is necessary, in which infancy, adolescent and middle age constitute necessary stages. The thought of a child evidently has an immature character. But even a correct idea expressed by a youth does not have the same weight as the same idea expressed by an old person, who has experienced life, and consequently has a deeper understanding of what these words actually mean.

In Hegel, the real development of human beings is presented in a mystical form, as the development of spirit. As an idealist, Hegel had no real conception of the development of society, although there are some brilliant anticipations of historical materialism in his writings. Thought appears here as an expression of the Absolute Idea, a mystical concept about which the only thing we learn, as Engels ironically put it, is that he tells us absolutely nothing about it. In reality, thought is the product of the human brain and nervous system, inseparable from the human body, which, in turn, depends upon food, which, in turn, presupposes human society and productive relations.

Thought is a product of matter that thinks, the highest achievement of nature. Inanimate matter possesses the potential to produce life. Even the lowest forms of life posses sensibility, irritability, which has the potential to produce, in higher animals a nervous system, and a brain. Hegel's "self consciousness" is merely a fantastic way of expressing the historical process by which real human beings gradually become conscious of themselves and the world in which they live. This does not come about easily or automatically, any more than the individual human being automatically acquires consciousness in the transition from infancy to adulthood. In both cases, the process takes place through a prolonged and often traumatic series of stages. The development of human thought, as reflected in the history of philosophy and science, and of culture in general, reveals itself as a contradictory process, in which one stage supersedes another, and, in its turn, is superseded. It is not a straight line, but one that is continuously interrupted, with periods of stagnation, faltering and even reversals, which, however, merely prepares the ground for new advances.

How Thought Develops

The very beginnings of human thought, mind in its immediate and primitive stage, is sense perception: primitive man, through his senses, begins by registering and memorising the data immediately provided by his environment, without understanding the true nature, causal relationships, and laws which underlie them. From observation and experience, gradually the human mind proceeds to make a number of generalisations of a more or less abstract character. This process involves a long and laborious journey lasting several millions of years, extremely slow at first, but rapidly gathering momentum in the last ten thousand years. Yet despite the colossal strives made by thought and science, ordinary thinking remains on quite a primitive level.

When we first consider any subject, we first form a notion of the whole, without grasping all the concrete content and detailed interconnections. It is merely a general outline and a bare abstraction. Thus, the Ionic philosophers and even Buddhism intuitively grasped the universe as a constantly changing dialectical whole. But this initial notion lacks all definition and concreteness. It is necessary to go further and provide the general picture with a definite expression, analysing and specifying the precise relations of its content. It has to be analysed and quantified. Without this, science in general is impossible. This is the difference between crude, immediate, undeveloped thought and science as such.

At the dawn of human consciousness, men and women did not clearly distinguish themselves from nature, just as a new-born baby does not distinguish itself from its mother. Gradually, over a long period, humans learned to distinguish, to cognize the world, by detecting focal points in the bewildering web of natural phenomena surrounding them, to observe, compare, generalise, and draw conclusions. In this way, over countless millennia, a series of important generalisations were built up from experience, which gradually came to crystallise into the familiar forms of thought which, because we are so familiar with them, we take for granted.

Common, everyday thought relies heavily on sense perception, immediate experience, appearances, and that peculiar hybrid of experience and superficial thinking called "common sense." These things are normally sufficient to carry us through life. But they

are insufficient to arrive at a scientific understanding, and, at a certain point, break down and become useless even for practical purposes. It is necessary to go beyond the immediate experience of sense perception, and to grasp the general processes, laws and hidden relations which lie beyond frequently deceptive appearance.

Ordinary human thought prefers to cling to what is concrete and familiar. It is easier to accept what is apparently fixed and well known rather than new ideas which challenge what is familiar and customary. Routine, tradition, custom and social convention represent a powerful force in society, akin to the force of inertia in mechanics. In normal periods most people are reluctant to question the society in which they live, its morality, ideology and property forms. All kind of prejudices, political ideas, "scientific" orthodoxy are accepted uncritically, until some profound change in people’s life force them to question what is.

Social and intellectual conformism is the commonest form of self deception. Familiar ideas are taken to be correct just because they are familiar. Thus, the notion that private property, money and the bourgeois family are eternal and unchanging features of life has sunk deeply into the popular consciousness, although it bares no relation whatsoever to the truth. Dialectics is the direct opposite of this superficial and commonplace way of thinking. Precisely because it challenges familiar ideas, it frequently arouses fierce opposition. How is it possible, to challenge the law of identity, which states what seems obvious, that "A equals A"? This so-called law is the logical reflection of a popular prejudice, that everything is what it is, and nothing else; that nothing changes. Dialectics, on the contrary, sets out from the opposite point of view, that everything changes, comes into being and passes away.

The empiricist thinker, who claims to take things "as they are," imagines himself to be very practical and concrete. But, in reality, things are not always what they seem to be, and frequently turn out to be their opposite. This kind of immediate sensuous knowledge is the lowest kind of knowledge, like that of a baby. A really scientific understanding of reality requires us to break down the information provided by sense perception in order to get at the true nature of the things under consideration. A deeper analysis always reveals the contradictory tendencies which underlie even the most apparently fixed, solid, and immutable things, which eventually will lead to them being transform into their opposites. It is precisely these contradictions which are the source of all life, movement and development throughout nature. In order to get a real understanding, it is necessary to take things, not just as they are, but also as they have been, and as they necessarily will become.

For simple everyday purposes, formal logic and "common sense" is sufficient. But beyond certain limits it no longer applies. At this point dialectics become absolutely essential. Unlike formal logic, which cannot grasp contradictions and seeks to eliminate them, dialectics represents the logic of contradiction, which is a fundamental aspect of nature and thought. By a process of analysis, dialectics reveals these contradictions and shows how they are resolved. However, new contradictions always appear, thus giving rise to a never-ending spiral of development. This process can be seen in the entire development of science and philosophy, which takes place through contradictions. This is not an accident. It reflects the nature of human knowledge as an infinite process in which

the solution of one problem immediately give rise to new ones, which are in turn resolved, and so on ad infinitum.

If we set out from the most elementary form of knowledge at the level of sense-experience, the limitations of formal logic and "common sense" very soon become clear. The mind simply registers the facts as we find them. At first sight, the truths of sense perception seem to be simple and self evident. They can be confidently relied upon but on closer examination, things are not so simple. What appears to be solid and reliable turns out not to be so. The ground begins to shift beneath our feet.

Sense-certainty sets out from the "here" and the "now." Of this Hegel says: "Sense-certainty itself has thus to be asked: What is the This? If we take it in the two-fold form of its existence, as the Now and as the Here, the dialectic it has in it will take a form as intelligible as the This itself. To the question, What is the Now? we reply, for example, the Now is night-time. To test the truth of this certainty of sense, a simple experiment is all we need: write that truth down. A truth cannot lose anything by being written down, and just as little by our preserving and keeping it. If we look again at the truth we have written down, look at it now, at this noon-time, we shall have to say it has turned stale and become out of date." (Op. cit., p. 151.)

This comment of Hegel recalls the famous paradoxes of Zeno in relation to motion. For example, if we wish to fix the position of an arrow flying, to say where it is now, the moment that we point to it, it has already passed, and therefore the "now" is not something that is, but something that has been. Thus, what initially appear to be true, turns out to be false. The reason is to be found in the contradictory nature of movement itself. Movement is a process, not a collection of separate points. Similarly, time consists of an infinite number of "nows," all taken together. Likewise the "here" turns out to be not a single "here," but a before and a behind, and an above and a below, and a right and a left. What is here, as a tree, the next minute is here as a house, or something else.

Dialectical and Formal Thinking

The correct application of the dialectical method means that the investigator must completely immerse himself in the study of the object, examining it from all sides in order to determine the inner contradictions and necessary laws of motion which governs its existence. The classical example of this method is to be found in the three volumes of Marx’s Capital. Marx did not invent the laws which govern the capitalist mode of production in an arbitrary fashion, but derived them from a painstaking dialectical analysis of all aspects of capitalism, tracing its historical development and following the process of commodity production through all its phases.

In his Philosophical Notebooks, which contain a detailed study of Hegel’s Science of Logic, Lenin points out that the first condition for dialectical thought is "the determination of the concept out of itself (the thing itself must be considered in its relations and in its development)." Or, put another way, the dialectical method sets out from "the absolute objectivity of consideration, (not examples, not divergences, but the Thing-in-Itself)." (Lenin, Collected Works, Vol. 38, p. 221.)

The first and lowest form of thought is sense-perception, that is to say, the information immediately given to us by our senses—what we see, hear, touch, etc. This is followed by understanding (Verstand), which attempts to explain what is, but does so in a one-sided way, registering isolated facts. Broadly speaking, the understanding here is identical with formal logic, ordinary thinking, and "common sense." We see that a thing exists, that it is itself, and nothing but itself. There seems nothing more to be said. But, in reality, there is a great deal more to be said. The understanding presents things as isolated, fixed and unchanging. Reality, however, is not like that at all.

A more advanced form of thinking is what Hegel (and Kant) call Reason (Vernunft). Reason attempts to go beyond the immediate facts established by understanding, to break them down, dissolve them, and behind the apparently solid exterior appearances, to reveal the inner contradictory tendencies, which, sooner or later, will lead to profound transformations. "The battle of reason," says Hegel, "is the struggle to break up the rigidity to which the understanding has reduced everything." (Hegel, Logic, p. 53.)

The first principle of dialectical thought is absolute objectivity. The subject matter must be approached objectively, and the final result must not be anticipated in advance. We must absorb ourselves in the subject matter, until we grasp not just a series of isolated facts, but their inner connection and lawfulness. The laws of dialectics, unlike formal logic are not arbitrary constructions which can be applied in an external manner to any particular content. They have been derived from a careful observation of the development of nature, society and human thought.

The usual forms of thought represented by formal logic can be applied to any subject matter in an external and arbitrary fashion. Indeed, the real content of the subject matter is entirely irrelevant to it. Formal logic, as expressed in the abstract law of identity (A equals A) appears to express an indisputable truth. In reality, it is an empty tautology, "monochrome formalism," or as Hegel says wittily, "the night in which all cows are black—that is the very na•vety of emptiness of knowledge." (Hegel, Phenomenology, p. 79.)

The so-called law of identity is only an abstract form with no real content, incapable of movement or further development. It cannot be applied to the dynamic reality of a restless universe, in which everything constantly changes, comes into being, and passes away, and therefore cannot be considered self-equal. In the same way, the law of contradiction is false because every really existing thing contains both positive and negative. It is and it is not because it is in a constant state of movement and change. The only thing which does not change is change itself. All attempts to fix the truth as a one-sided and static thing is doomed to failure. As Hegel wittily expressed it, the truth is "bacchanalian revel." The existence of contradiction is reflected intuitively in the popular consciousness in the form of proverbs and sayings which, however, because of their unsystematic and intuitive character, often contradict each other. For example, "One man’s meat is another man’s poison."

In science also we see contradictions at all levels, for example attraction and repulsion, North and South in magnetism, positive and negative in electricity, action and reaction in mechanics, contraction and expansion, etc. As against formal logic, dialectics does not

inflict itself on nature, but derives its categories from reality itself. Real dialectics has nothing in common with the caricature outlined by its critics, who try to present it as a subjective and arbitrary play on words. This is really the dialectic of Sophism, which, like formal logic, is also applied in an external manner to any given content with the intention of manipulating contradictions in a subjective manner. Nor does dialectics have anything in common with the gross oversimplification of the "triad" (thesis, antithesis, synthesis), which was adopted by Kant and turned into a lifeless formulae. Real dialectics attempts to discover, by means of a rigorously objective analysis, the inner logic and laws of motion of a given phenomenon.

Hegel's Logic

The Logic of Hegel is one of the pinnacles of human thought. It is the systematic exposition and development of all the forms of thought, from the more primitive undeveloped thought, up to the highest form of dialectical reasoning, which Hegel calls the Notion.

He sets out with the most general proposition possible—that of "pure being"—something that seems to require no further proof. From this extremely abstract idea, he proceeds, step by step, along a process which leads from the abstract to the concrete.

This process of reasoning proceeds by stages, in which each stage negates the previous one. The history of thought, particularly that of philosophy and science, shows that knowledge is acquired precisely in this way, in a never-ending process whereby we obtain an increasingly precise idea of the workings of the universe. In Hegel, each stage is no sooner affirmed than it is negated, and the result is a higher, richer, more concrete idea.

In general outline, Hegel's Logic can be divided into three main parts: The Doctrine of Being, The Doctrine of Essence (essential nature) and the Doctrine of the Notion.

Hegel begins his philosophy with the most fundamental category of thought—the category of Being. Evidently, anything which we consider must exist, before anything else. This seems to be the basis of all our knowledge. But things are not so simple as that. The bare statement of existence, without further details, does not get us very far. We want to know more. But the moment we pass from the abstract idea of being in general to a more concrete idea, being turns into its opposite. Hegel shows that being in general is the same as—nothing.

This idea seems strange, but actually can be seen to be true on many different levels. If we try to eliminate all contradiction from things, and cling to the idea that they just are, we arrive at the opposite conclusion, because there can be no being without not-being, just as there can be no life without death, and no light without darkness. People who have spent a long time in the Arctic know that the effect of unrelieved whiteness is the same as that of total blackness to the human vision.

It is, in fact, an empty abstraction, since it lacks all concreteness. In reality, the dialectical unity of being and nothing is becoming. This is what Heraclitus meant when he said "everything is and is not, because everything is in flux." Everyone knows from

experience that things are frequently not what they seem to be. Things that appear to be stable, so that we can say "they are," on closer examination turn out to be unstable, and change into something else, and they "are not." Moreover, this contradiction between being and not being is the basis of all life and movement.

In Hegel, the category of being represents the stage of primitive, undeveloped thought. It is thought only as a potential, like the thought of a small child, or early proto-humans. It is embryonic thought. An embryo begins as a single cell, with no clearly developed features. It is not clearly identifiable as a human being. In order to develop, it must first negate itself. Inside the cell, there are contradictory tendencies which give rise to a process of inner differentiation. When these conflicting tendencies reach a certain point, the cell divides in two. The original, undifferentiated cell has ceased to exist. It has been cancelled, negated. Yet at the same time, it has been preserved, and carried onto a higher level. The process is repeated many times, giving rise to increasing organisation, and greater complexity, with more clearly distinguishable features, eventually giving rise to a fully-fledged human being.

The point is that, in real life, the negative side of things is equally as important as the positive. We are accustomed to look upon life and death as completely opposite poles. But in practice, they are two parts of the same process, and are inseparable. The process of life, growth and development can only take place through the constant renewal of all the cells of the organism, some dying, others coming into being. Even on the most primitive level, life involves constant change in which the organism constantly absorbs food from its surroundings and uses it to build itself, while getting rid of waste matter. Therefore, every living thing is and is not at the same time, because everything is in a constant state of flux. To be without contradiction is to lack all inner differentiation, to have no movement, to be in a state of static equilibrium—in a word, to be dead.

In the words of Prigogine and Stengers:

"The living cell presents an incessant metabolic activity. There thousands of chemical reactions take place simultaneously to transform the matter the cell feeds on, to synthesise the fundamental biomolecules, and to eliminate waste products. As regards both the different reaction rates and the reaction sites within the cell, this chemical activity is highly coordinated. The biological structure thus combines order and activity. In contrast, an equilibrium state remains inert even though it may be structured, as, for example, with a crystal." (Prigogine and Stengers, Order out of Chaos, p. 131.)

At first sight, these observations may seem like pointless subtleties. In point of fact, they are extremely profound reflections, which are not only applicable to thought, but also to nature. And, although it is not always obvious, the same is true of inanimate nature also. Indeed, Hegel considered that the two were inseparably linked. "Everything flows and nothing stays," said Heraclitus. "You can’t step twice into the same river." Hegel here is saying the same thing. At the heart of this philosophy is a dynamic view of the universe; a view which deals with things as living processes, not dead objects; in their essential interrelations, not separate bits and pieces, or arbitrary lists; as a whole, which is greater than the sum of the parts.

Quantity and Quality

Everything can be seen from two points of view—quality and quantity. The fact that the world consists of a sum total of processes which are constantly changing does not mean that real things do not have a definite form of existence, an identity. However much an object changes, it remains, within certain limits, a qualitatively distinct form of existence, different from another. It is this qualitative definiteness which gives things stability, differentiates them, and makes the world so rich and boundlessly varied.

The properties of a thing are what make it what it is. But this quality is not reducible to its separate properties. It is bound up with the object as a whole. Thus, a human being is not just an assemblage of bone tissue, blood, muscles, etc. Life itself is a complex phenomenon which cannot be reduced to the sum total of its individual molecules, but arises from the interactions between them. To use the modern terminology of complexity theory, life is an emergent phenomenon.

The relation of whole and parts was dealt with at length by Hegel, who wrote: "The limbs and organs, for instance, of an organic body are not merely parts of it: it is only in their unity that they are what they are, and they are unquestionably affected by that unity, as they also in turn affect it. These limbs and organs become mere parts, only when they pass under the hands of the anatomist, whose occupation, be it remembered, is not with the living body but with the corpse. Not that such analysis is illegitimate: we only mean that the external and mechanical relation of whole and parts is not sufficient for us, if we want to study organic life in its truth." (Hegel, Logic, p. 191-2.)

It is interesting to note that the latest ideas which have caught the imagination of an important section of the scientific community—the theories of chaos and complexity—were anticipated long ago by Hegel, and, in many respects, received a much more comprehensive treatment in his hands. A case in point is his explanation of the transformation of quantity into quality, whereby an accumulation of small changes brings about a sudden change in quality.

In addition to the quality which defines the essential features of an object, all things possess quantitative features—a definite magnitude, number, volume, speed of its processes, degree of development of its properties, and so on. The quantitative side of things is that which permits them to be divided (actually or mentally) into their constituent parts and put together again. In contrast to quality, changes in quantity do not alter the nature of the whole, or cause its destruction. Only when a definite limit is reached, which is different in each case, do changes of quantitative character cause a sudden qualitative transformation.

In mathematics, the quantitative aspect of things is separated from their content and regarded as something independent. The extremely wide field of applicability of mathematics to spheres of natural science and technology with very different contents is explained by the fact that it deals purely with quantitative relations. Here, it is claimed, it is impossible to reduce quality to quantity. This is the fundamental error of which Marx and Engels referred to as the Metaphysical mode of thought, and which nowadays is termed reductionism. There is nothing in the real world that consists only of quantity, just

as there is nothing which is pure quality. Everything in reality consists of the unity of quantity and quality, which Hegel called Measure.

Measure is the organic unity of quantity and quality. Every qualitatively distinct object, as we have seen, contains quantitative elements which are mobile and variable. Living organisms grow at a certain rate. Gases and liquids are affected by variations in temperature. The behaviour of a water droplet or a heap of sand is determined by its size, and so on. These mutations, however, are necessarily bounded by definite limits, which are different in each case, but in practice can usually be discovered. Carried beyond this limit, quantitative changes bring about a qualitative transformation. In its turn, the qualitative change brings about a change in its quantitative attributes. There are not only changes of quantity to quality, but also the opposite process, where a change in quality causes a change in quantity. The critical points of transition from one state to another are expressed as nodal points in Hegel's nodal line of measurement.

Essence

The Doctrine of Essence is the most important part of Hegel's philosophy, because it is here that he explains the dialectic in detail. Human thought does not stop at what is immediately given in sense perception, but seeks to go beyond it and grasp the thing-in-itself. Beyond appearance, we look for the essence of a thing. But this is not immediately accessible. We can see the sun and moon, but we cannot "see" the laws of gravity. In order to go beyond appearance, the mind must be actively brought into play, to break down what we earlier learned through understanding. If the understanding is positive, asserting that a given thing "is," dialectical reasoning is essentially negative, in that it dissolves what "is," and reveals the inner contradictions, which will inevitably destroy it.

The contradiction which lies at the heart of all things is expressed as the idea of the unity of opposites. Dialectically, what seem to be mutually exclusive phenomena are actually inseparable, as Hegel explains:

"Positive and negative are supposed to express an absolute difference. The two however are at bottom the same: the name of either might be transferred to the other. Thus, for example, debts and assets are not two particular, self-subsisting species of property. What is negative to the debtor is positive to the creditor. A way to the east is also a way to the west. Positive and negative are therefore intrinsically conditioned by one another, and are only in relation to each other. The north pole of the magnet cannot be without the south pole, and vice versa. If we cut a magnet in two, we have not a north pole in one piece, and a south pole in the other. Similarly, in electricity, the positive and the negative are not two diverse and independent fluids." (Hegel, Logic, p. 173.)

In the process of analysis, Hegel enumerates a series of important stages: positive and negative; necessity and accident; quantity and quality; form and content; action and repulsion; and so on. One of the central features of Essence is that it is relative—everything is related to something else, in a universal web of interaction. The basic law of elementary knowledge (understanding) is the law of identity ("A = A"). This is generally considered as the basis of all that we know. Up to a point, this is correct. Without the law of identity, coherent thought would be impossible. We ascertain the basic fact of

existence, and focus our attention on a particular thing. However, identity presupposes difference. A cat is a cat, because it is not a dog, a mouse, an elephant, and so on. In order to establish identity, we must compare something to another.

In real life, nothing is purely itself, as implied by the law of identity, despite its apparently absolute character. Everything is determined by everything else. In that sense everything is relative. As Engels remarks: "The true nature of the determinations of ‘essence’ is expressed by Hegel himself (EnzyklopÖdie, I, paragraph 111, addendum): ‘In essence everything is relative’ (e.g., positive and negative, which have meaning only in their relation, not each for itself)." (Engels, Dialectics of Nature, p. 283.)

Not only that. Nothing is simple, as also implied in the law of identity. As we saw in relation to the simple cell or embryo, concrete being, as opposed to the purely abstract being of mere "identity," must contain inner differentiation. Moreover, this differentiation contains the seeds of contradiction. In order to develop, in order to live, the cell must contain the tendency toward self-dissolution, towards division, towards negation. This inner tension is, in fact, the basis of all life. But it is also found in non-living objects, for example, the phenomenon of surface tension in a drop of water, which holds the molecules in a certain order, and innumerable other examples.

The attempt to banish contradiction from thought has been an obsession of logicians for centuries. Hegel was the first one to show that, in fact, contradiction lies at the heart of everything that really exists. If we attempt to think of the world without contradiction, as traditional formal logic tries to do, all that we achieve is to introduce insoluble contradictions into thought. This was the real meaning of Kant’s "antimonies." To separate identity and difference, to attempt to deny the existence of contradiction, leads thought into a barren and empty formalism.

Appearance and Essence

Most people realise that "appearances are deceptive." However, this is only relatively true. In order to arrive at an understanding of the essence of a thing, we must begin by a thorough acquaintance with precisely these "appearances," that is, with all the physical features, properties and tendencies we can observe. In the course of such an analysis, it will become clear that certain facts can be omitted as "unessential," and, gradually, we will arrive at the most fundamental characteristics of the object under consideration.

It is very common to say about somebody "yes, but he’s not really like that." The implication is that people are not what they seem to be. Appearance is one thing, but essence is supposed to be completely different. However, this is not quite true. If we only have a slight acquaintance with a person, then it is true that we cannot form an accurate impression of him or her on the basis of their conduct. It may be completely untypical. But if we have known people for a long time, we have sufficient reason to believe that we know them as they are. We precisely base ourselves on "appearances" because there is nothing else to base ourselves on. The Bible says "by their fruits shall you know them," and that is correct. As a man or woman lives and acts, so they are. There is nothing else to look for.

This was the fundamental error of Kant, when he tried to draw a line between appearances and some mysterious "thing" that lay beyond experience which was supposed to be forever beyond human knowledge. In fact, once we know all the properties of a thing, we know the thing itself. We may be limited at any given moment in time by lack of information, but, in principle, there is nothing which is forever barred to human knowledge, except one thing—to know everything about an infinite universe. This is no real limitation, but simply an expression of the dialectical relation between the finite nature of individuals, and an infinite universe, which is constantly revealing new secrets. And although the particular knowledge of one person is finite, from one generation to another, the sum-total of knowledge and understanding of humanity increases. The process of learning is never-ending. Precisely in this lies its fascination and its beauty.

We set out from what is known, in order to discover what is not known. On thing leads to another. A doctor, basing himself on all his knowledge of medical science and past experience, carefully examines all the available symptoms and arrives at a diagnosis. A sailor will study the wind and tides in order to guess the possibilities of putting to sea. In this way, essence is manifested through appearance, although it requires a certain skill and understanding to pass from the one to the other.

One of the greatest errors it is possible to commit when dealing with the processes that occur in society is to approach them as static and fixed, that is to say, from the standpoint of formal logic. One frequently comes across this kind of thing—narrow-minded prejudice masquerading as "practical wisdom." It is said that "people will never change," "things will always be as they are," and "there is nothing new under the sun." This kind of superficial thought pretends to be profound, but really only reveals the kind of ignorance which is content with itself. No rational reason is given for such assertions. Occasionally an attempt is made to give it a biological basis, with vague references to something called "human nature," from which we instantly deduce that the individual in question knows nothing whatsoever about humans or their nature.

This kind of mentality is strictly limited to its own narrow experience of the world of appearance in the most superficial sense. It is very like a man who is constantly skating on the surface, without bothering to inquire about the thickness of the ice. Such a person may get away with it nine times out of ten. One day, however, he finds himself drowning in icy water. At that precise moment, he begins to realise that maybe the ice was not as solid as it looked.

"A is A." You are you. I am myself. People are people. A peseta is a peseta. Society is society. The trade unions are the trade unions. Such sentences seem reassuring, but in fact are empty of all content. Insofar as they express anything at all, it is the idea that everything is itself, and nothing changes. However, experience tells us something different. Things are constantly changing, and, at a critical point, small quantitative changes can produce massive transformations.

Form and Content

There are many contradictions in things. For instance, the contradiction between form

and content. Every gardener knows that a seed carefully planted in a pot will produce a plant. Initially, the pot protects the young plant and helps it to thrive. But at a certain stage, the roots become too big for the space allowed. The gardener must remove it from the pot, or it will die. Similarly, the human embryo is protected by the mother's womb for nine months. At this point, a critical stage is reached in which, either the baby is separated from the mother's body, or both will perish. These are examples of the contradiction between form and content which are readily understood. Another example would be the way in which the forces which accumulate beneath the earth's crust eventually produce an earthquake.

Similar forces build up within society, which also has its "fault-lines." The action of these forces is no more visible than those that cause an earthquake. To the superficial observer, nothing is happening. Everything is "normal." The skilled observer, however, is able to detect the symptoms of subterranean activity in society, just as a competent geologist can read a seismograph. Trotsky once defined theory as "the superiority of foresight over astonishment." It is the fate of superficial and empirical thought to be constantly astonished, like the man who fell through the ice. It is the price one pays for confusing appearance with essence and form with content.

The essence of a thing is the sum total of its most fundamental properties. The task of dialectical analysis is to determine these. In each case it will be found that there is a potential contradiction between the present state and tendencies which are tending to dissolve it. In classical mechanics, the idea of a perfect equilibrium plays a central role. Things tend to return to equilibrium. That is, at least, in theory. In real life, a perfect equilibrium is a rarity. Whenever equilibrium is reached, it tends to be temporary and unstable. Development and change presupposes this. In the intensive ward of a hospital, "equilibrium" signifies death.

When referring to the properties of a thing, it is customary to use the verb "to have." (Fire has the property of burning; a human being has the properties of breathing, thinking, eating, etc.) This gives a wrong idea. A child has an ice-cream. A woman has a dog. The relationship here is accidental and external, since the child and the woman could equally well not have these things, and still be a child and a woman. A thing does not "have" properties. It is the sum-total of its properties. Take these away, and we are left with nothing, which is what Kant's Thing-in-Itself really was. This is an extremely important idea, which is only now beginning to be understood by scientists. The whole cannot be reduced to the sum of its parts, because in entering into a dynamic relationship, the parts themselves become transformed, and give rise to an entirely new situation, governed by qualitatively different laws.

This phenomenon can be seen in society. Trotsky pointed out that the working class, without organisation, is only "raw material for exploitation." This fact is starkly revealed in periods like the present, when trade unions are eliminated or undermined in many workplaces. Historically, the movement of the workers to organise themselves brings about a complete transformation of the situation. Quantity becomes transformed into quality. Whereas individual workers are powerless, the class organised as a class has colossal power, at least potentially. Not a wheel turns, not a telephone rings, not a light bulb shines without the kind permission of the working class. In Hegelian language, the

working class before it is organised, is only a class "in itself" (that is, an unrealised potential). Once it becomes organised and conscious of its power, it becomes a class "for itself." Of course, Hegel was far from drawing such explicitly revolutionary conclusions from his dialectical method. Being an idealist, his main concern was to present the dialectic as the process of development of the Spirit. Real relations are stood on their head, and the real world is presented in a mystified form. But the real content constantly finds its way through the dense fog of idealism, like shafts of sunlight through the clouds.

In essence, as Engels pointed out, everything is relative. Things are what they are thanks to their interrelations with other things. This also can be seen in society. Things which are commonly believed to be real entities are, in fact, the product of particular relationships, which have sunk so deeply into people's consciousness that they acquire the force of prejudice. Such a thing is the institution of monarchy:

"Na•ve minds," Trotsky observed, "think that the office of kingship lodges in the king himself, in his ermine cloak and his crown, in his flesh and bones. As a matter of fact, the office of kingship is an interrelation between people. The king is king only because the interests and prejudices of millions of people are refracted through his person. When the flood of development sweeps away these interrelations, then the king appears to be only a washed-out man with a flabby lower lip. He who was once called Alfonso XIII could discourse upon this from fresh impressions.

"The leader by will of the people differs from the leader by will of God in that the former is compelled to clear the road for himself or, at any rate, to assist the conjuncture of events in discovering him. Nevertheless, the leader is always a relation between people, the individual supply to meet the collective demand. The controversy over Hitler's personality becomes the sharper the more the secret of his success is sought in himself. In the meantime, another political figure would be difficult to find that is in the same measure the focus of anonymous historic forces. Not every exasperated petty bourgeois could have become Hitler, but a particle of Hitler is lodged in every exasperated petty bourgeois." (Trotsky, The Struggle Against Fascism in Germany, p. 399.)

Necessity and Accident

In further analysing the nature of being in all its different manifestations, Hegel deals with the relation between potential and actual, and also between necessity and accident ("contingency"). We shall return to the question of necessity and accident later on, as it has occupied a central role in modern science, and is still a highly controversial subject. In relation to this question, it is important to clarify one of Hegel's most famous (or notorious) sayings: "What is rational is actual, and what is actual is rational." (Hegel, Philosophy of Right, p. 10.) At first sight, this statement seems mystifying, and also reactionary, since it seems to imply that all that is exists is rational, and therefore justified. This, however, was not at all what Hegel meant, as Engels explains:

"Now, according to Hegel, reality is, however, in no way an attribute predicable of any given state of affairs, social or political, in all circumstances and at all times. On the contrary. The Roman Republic was real, but so was the Roman Empire, which superseded it. In 1789 the French monarchy had become so unreal, that is to say, so

robbed of all necessity, so irrational, that it had to be destroyed by the Great Revolution, of which Hegel always speaks with the greatest enthusiasm. In this case, therefore, the monarchy was the unreal and the revolution the real. And so, in the course of development, all that was previously real becomes unreal, loses its necessity, its right of existence, its rationality. And in the place of moribund reality comes a new, viable reality—peacefully if the old has enough intelligence to go to its death without a struggle; forcibly if it resists this necessity. Thus the Hegelian proposition turns into its opposite through Hegelian dialectics itself: All that is real in the sphere of human history becomes irrational in the process of time, is therefore irrational by its very destination, is tainted beforehand with irrationality; and everything which is rational in the minds of men is destined to become real, however much it may contradict existing apparent reality. In accordance with all the rules of the Hegelian method of thought, the proposition of the rationality of everything which is real resolves itself into the other proposition: All that exists deserves to perish." (MESW, Vol. 3, pp. 338-9.)

A given form of society is "rational" to the degree that it achieves its purpose, that is, that it develops the productive forces, raises the cultural level, and thus advances human progress. Once it fails to do this, it enters into contradiction with itself, that is, it becomes irrational and unreal, and no longer has any right to exist. Thus, even in the most apparently reactionary utterances of Hegel, there is hidden a revolutionary idea.

All that exists evidently does so of necessity. But not everything can exist. Potential existence is not yet actual existence. In The Science of Logic, Hegel carefully traces the process whereby something passes from a state of being merely possible to the point where possibility becomes probability, and the latter becomes inevitable ("necessity"). In view of the colossal confusion that has arisen in modern science around the issue of "probability," a study of Hegel’s thorough and profound treatment of this subject is highly instructive.

Possibility and actuality denote the dialectical development of the real world and the various stages in the emergence and development of objects. A thing which exists in potential contains within itself the objective tendency of development, or at least the absence of conditions which would preclude its coming into being. However, there is a difference between abstract possibility and real potential, and the two things are frequently confused. Abstract or formal possibility merely expresses the absence of any conditions that might exclude a particular phenomenon, but it does not assume the presence of conditions which would make its appearance inevitable.

This leads to endless confusion, and is actually a kind of trick which serves to justify all kinds of absurd and arbitrary ideas. For example, it is said that if a monkey were allowed to hammer away at a typewriter for long enough, it would eventually produce one of Shakespeare’s sonnets. This objective seems too modest. Why only one sonnet? Why not the collected works of Shakespeare? Indeed, why not the whole of world literature, with the theory of relativity and Beethoven’s symphonies thrown in for good measure? The bare assertion that it is "statistically possible" does not take us a single step further. The complex processes of nature, society and human thought are not all susceptible to simple statistical treatment, nor will great works of literature emerge out of mere accident, no matter how long we wait for our monkey to deliver the goods.

In order for potential to become actual, a particular concatenation of circumstances is required. Moreover, this is not a simple, linear process, but a dialectical one, in which an accumulation of small quantitative changes eventually produces a qualitative leap. Real, as opposed to abstract, possibility implies the presence of all the necessary factors out of which the potential will lose its character of provisionality, and become actual. And, as Hegel explains, it will remain actual only for as long as these conditions exist, and no longer. This is true whether we are referring to the life of an individual, a given socioeconomic form, a scientific theory, or any natural phenomenon. The point at which a change becomes inevitable can be determined by the method invented by Hegel and known as the "nodal line of measurement." If we regard any process as a line, it will be seen that there are specific points ("nodal points") on the line of development, where the process experiences a sudden acceleration, or qualitative leap.

It is easy to identify cause and effect in isolated cases, as when one hits a ball with a bat. But in a wider sense, the notion of causality becomes far more complicated. Individual causes and effects become lost in a vast ocean of interaction, where cause becomes transformed into effect and vice versa. Just try tracing back even the simplest event to its "ultimate causes" and you will see that eternity will not be long enough to do it. There will always be some new cause, and that in turn will have to be explained, and so on ad infinitum. This paradox has entered the popular consciousness in such sayings as this one:

For the want of a nail, a shoe was lost;
For the want of a shoe, a horse was lost;
For the want of a horse, a rider was lost;
For the want of a rider, a battle was lost;
For the want of a battle, a kingdom was lost;
...And all for the want of a nail.

The impossibility of establishing a "final cause" has led some people to abandon the idea of cause altogether. Everything is considered to be random and accidental. In the 20th century this position has been adopted, at least in theory, by a large number of scientists on the basis of an incorrect interpretation of the results of quantum physics, particularly the philosophical positions of Werner Heisenberg. We shall return to this later. Suffice it to say that Hegel answered these arguments in advance, when he explained the dialectical relation between accident and necessity.

Hegel explains that there is no such thing as true causality, in the sense of an isolated cause and effect. Every effect has a counter-effect, and every action has a counter-action. The idea of an isolated cause and effect is an abstraction taken from classical Newtonian physics, which Hegel was highly critical of, although it enjoyed tremendous prestige at that time. Here again, Hegel was in advance of his time. Instead of the action-reaction of mechanics, he advanced the notion of Reciprocity, of universal interaction. Everything influences everything else, and is in turn, influenced and determined by everything. Hegel thus re-introduced the concept of accident which had been rigorously banned from science by the mechanist philosophy of Newton and Laplace.

At first sight, we seem to be lost in a vast number of accidents. But this confusion is only

apparent. Order emerges out of chaos. The accidental phenomena which constantly flash in and out of existence, like the waves on the face of an ocean, express a deeper process, which is not accidental but necessary. At a decisive point, this necessity reveals itself through accident.

This idea of the dialectical unity of necessity and accident may seem strange, but it is strikingly confirmed by a whole series of observations from the most varied fields of science and society. The mechanism of natural selection in the theory of evolution is the best-known example. But there are many others. In the last few years, there have been many discoveries in the field of chaos and complexity theory which precisely detail how "order arises out of chaos," which is exactly what Hegel worked out one and a half centuries earlier.

"Classical" chemical reactions are seen as very random processes. The molecules involved are evenly distributed in space, and their spread is distributed "normally" i.e., in a Gauss curve. These kinds of reaction fit into the concept of Boltzmann, wherein all side-chains of the reaction will fade out and the reaction will end up in a stable reaction, an immobile equilibrium. However, in recent decades chemical reactions were discovered that deviate from this ideal and simplified concept. They are known under the common name of "chemical clocks." The most famous examples are the Belousov-Zhabotinsky reaction, and the Brussels model devised by Ilya Prigogine.

Linear thermodynamics describes a stable, predictable behaviour of systems that tend towards the minimum level of activity possible. However, when the thermodynamic forces acting on a system reach the point where the linear region is exceeded, stability can no longer be assumed. Turbulence arises. For a long time turbulence was regarded as a synonym for disorder or chaos. But now, it has been discovered that what appears to be merely chaotic disorder on the macroscopic (large-scale) level, is, in fact, highly organised on the microscopic (small-scale) level.

Today, the study of chemical instabilities has become common. Of special interest is the research done in Brussels under the guidance of chaos theorist Ilya Prigogine. The study of what happens beyond the critical point where chemical instability commences has enormous interest from the standpoint of dialectics. Of especial interest here is the phenomenon of the "chemical clock." The Brussels model (nicknamed the "Brusselator" by American scientists) describes the behaviour of gas molecules. Suppose there are two types of molecules, "red" and "blue," in a state of chaotic, totally random motion. One would expect that, at a given moment, there would be an irregular distribution of molecules, producing a "violent" colour, with occasional flashes of red or blue. But in a chemical clock, this does not occur beyond the critical point. The system is all blue, then all red, and these changes occur at regular interval.

"Such a degree of order stemming from the activity of billions of molecules seems incredible," say Prigogine and Stengers, "and indeed, if chemical clocks had not been observed, no one would believe that such a process is possible. To change colour all at once, molecules must have a way to ‘communicate.’ The system has to act as a whole. We will return repeatedly to this key word, communicate, which is of obvious importance in so many fields, from chemistry to neurophysiology. Dissipative structures introduce

probably one of the simplest physical mechanisms for communication." (Prigogine and Stengers, Order Out of Chaos, p. 148.)

The phenomena of the "chemical clock" shows how in nature order can arise spontaneously out of chaos at a certain point. This is an important observation, especial in relation to the way in which life arises from inorganic matter.

"'Order through fluctuations' models introduce an unstable world where small causes can have large effects, but this world is not arbitrary. On the contrary, the reasons for the amplification of a small event are a legitimate matter for rational inquiry." (Prigogine and Stengers.) (Prigogine and Stengers, Order Out of Chaos, p. 206.)

We must remember that Hegel was writing at the beginning of the last century, when science was completely dominated by classical mechanical physics, and half a century before Darwin developed the idea of natural selection through the medium of random mutations. He had no scientific evidence to back up his theory that necessity expresses itself through accident. But that is the central idea behind the most recent innovative thinking in science.

This profound law is equally fundamental to an understanding of history. As Marx wrote to Kugelmann in 1871:

"World history would indeed be easy to make if the struggle were to be taken up only on condition of infallibly favourable chances. It would on the other hand be of a very mystical nature, if 'accidents' played no part. These accidents naturally form part of the general course of development and are compensated by other accidents. But acceleration and delay are very much dependent upon such 'accidents,' including the 'accident' of the character of the people who head the movement." (Marx and Engels, Selected Correspondence, p. 264, Moscow, 1965.)

Engels made the same point a few years later in relation to the role of "great men" in history:

"Men make their history themselves, but not as yet with a collective will according to a collective plan or even in a definite delimited given society. Their aspirations clash, and for that very reason all such societies are governed by necessity, the complement and form of appearance of which is accident. The necessity which here asserts itself athwart all accident is again ultimately economic necessity. This is where the so-called great men come in for treatment. That such and such a man and precisely that man arises at a particular time in a particular country is, of course, pure chance. But cut him out and there will be a demand for a substitute, and this substitute will be found, good or bad, but in the long run he will be found." (Marx and Engels, Selected Correspondence. Engels to Starkenburg, 25th January 1894, p. 467.)

The Notion

In Hegel's dialectic the supreme achievement of thought is the Notion. The development of the Notion is described by Hegel as a process which proceeds from abstract to concrete. It signifies a deepening of knowledge, and a development from a lower to a

higher degree of understanding, of the development from potential to actual. At the beginning, the Notion is referred to as "in itself," or implicit. It is later developed, and becomes the Notion "for itself," or explicit. In its highest form it is the union of both these aspect, "in and for itself." In the Notion the process of development reaches its highest point. What was only implicit at the beginning now becomes explicit. It is a return to the starting-point, but on a qualitatively higher level.

In his main work, The Science of Logic, Hegel does not end with the Notion, but goes on to the Absolute Idea, of which all that can be said is that he tells us absolutely nothing about it. This is typical of the contradictions Hegel's idealism landed him in. The dialectic cannot lead to an Absolute Idea, or any other final solution. To imply that there is an end to the process of human knowledge conflicts with the letter and spirit of dialectics. So the Hegelian philosophy ended up in an insoluble contradiction. This could only be solved by a radical break with all of previous philosophy.

The epoch-making quality of Hegel's philosophy consisted in the fact that, by summing up the whole history of philosophy in such a comprehensive way, he made it impossible to proceed any further along the traditional philosophical lines. Secondly, the dialectical method, which he perfected, provided the basis for a whole new world outlook, one that did not confine itself to the analysis and criticism of ideas, but involved an analysis of the history of society and a revolutionary criticism of the existing social order. Hegel's great contribution was well expressed by Engels in Anti-Dühring:

"That [the] Hegel[ian system] did not solve the problem [it posed itself] is immaterial here. Its epoch-making merit was that it posed the problem. This problem is indeed one that no single individual will ever be able to solve. Although Hegel was—with Saint-Simon—the most encyclopaedic mind of his time, he was restricted, first, by the necessarily limited extent of his own knowledge and, second, by the limited extent and depth of the knowledge and conceptions of his epoch. To these limits a third must be added. Hegel was an idealist. To him the thoughts within his brain were not the more or less abstract images of actual things and processes, but on the contrary, things and their development were only the realised images of the 'Idea,' existing somewhere from eternity before the world existed. Consequently everything was stood on its head and the actual interconnection of things in the world was completely reversed.

"Although Hegel had grasped some individual interconnections correctly and with genius, yet for the reasons just given there is much that in point of detail necessarily turned out botched, artificial, laboured, in a word, upside down. The Hegelian system as such was a colossal miscarriage—but it was also the last of its kind. In fact, it was suffering from an internal and incurable contradiction. On the one hand, its essential postulate was the conception that human history is a process of development, which, by its very nature, cannot find its intellectual final term in the discovery of any so-called absolute truth. But on the other hand, it laid claim to being the very essence of precisely this absolute truth. A system of natural and historical knowledge which is all-embracing and final for all time is in contradiction with the fundamental laws of dialectical thinking; which by no means excludes, but on the contrary includes, the idea that systematic knowledge of the entire external world can make giant strides from generation to generation." (Engels, Anti-Dühring, pp. 29-30.)

Hegel’s dialectic was brilliantly conceived, but ultimately deficient, because it was limited to the domain of thought. Nevertheless, it contained the potential for a major departure in thought, one that was to radically alter not just the history of philosophy, but that of the world. To paraphrase Hegel, what was present in itself (i.e., potentially) in his work became a realised idea—an idea in and for itself in the revolutionary doctrine of Marxism, where philosophy finally gives up its character as a one-sided abstract, mental activity, and enters the realm of practice.

Aristotle already explained the relationship between potential and actual. At all levels of nature, society, thought, and even the development of individual human beings from childhood to maturity, we see the same process. Everything that exists contains within itself the potential for further development, that is, to perfect itself, to become something different to what it is. The whole of human history can be seen as the struggle of humanity to realise its potential. Ultimately, the aim of socialism is to create the necessary conditions whereby this goal can be finally realised, that men and women can become actually what they always were potentially. Here, however, we have already left the dimly-lit study of the philosopher, and stepped out into the broad daylight of human life, activity and struggle.

"The philosophers have only interpreted the world, in various ways; the point, however is to change it." (MESW, Theses on Feuerbach, no. 11, Vol. 1, p. 15.)

Feuerbach

Between Hegel and Marx stands the tragic figure of Ludwig Feuerbach (1804-1872). After the death of Hegel, the Hegelian philosophy entered into a phase of rapid degeneration. The Hegelian school split into two wings—the right and left. The Hegelian right produced not one figure worthy of mention. The Hegelian left or Young Hegelians represented the radical wing of Hegel’s followers. Active in the 1830s and 1840s, they interpreted Hegel’s ideas in the spirit of German liberalism. Their main emphasis was on the criticism of Christianity.

In 1835 David Strauss, a left Hegelian, published his book Das Leben Jesu (The Life of Jesus), a critical analysis of the Bible, in which Jesus is portrait as an ordinary historical personality. Later Bruno Bauer argued that religion was a false consciousness, and that the person of Jesus was a fiction. Although they made some advances, their general approach remained idealist, and therefore was condemned to sterility. One of the main concerns was the question of how false consciousness arises in society and becomes a power over the minds of men.

Strauss explained this by the traditional persistence of mythological ideas. Bauer traced the source of this phenomenon to the alienation of the products of individual "self-consciousness." Max Stirner’s ideas anticipated anarchism. However, their extreme individualism, according to which the motive force of history was the "critically thinking individual," reduced all their revolutionary threads to empty phrases. They regarded the masses as the "enemy of the spirit" and progress, and had no notion of real social or economic development. However, the bankruptcy of the Hegelian left was finally exposed in the writing of Ludwig Feuerbach and the demolition was completed by Marx

and Engels in their earliest joint writings—The Holy Family and The German Ideology.

A key role in the transition from Hegelianism to materialist dialectics was played by Feuerbach. To his own age, he seemed like Promicious, the Titan who dared to steal fire from the gods and give it to humans. The appearance of his book, The Essence of Christianity in 1841, had revolutionary consequences. Specially great was his impact on the young Marx and Engels. Engels later wrote: "Enthusiasm was general and we all became Feuerbachians at once." Feuerbach was a materialist. Born at Landshut in Bavaria, he started to study theology in Heidelberg, but within a year abandoned it, and, at the age of 20, went to Berlin to study philosophy under Hegel.

The young Feuerbach immediately fell under the spell of the great man, and become and ardent Hegelian. He later became a professor of philosophy at Erlangen. Although he was identified with the Hegelian left, Feuerbach was dissatisfied with its empty and abstract idealism, and set out to make a thorough criticism of Hegel's philosophy from the standpoint of materialism. His writings, specially The Essence of Christianity, contain valuable insights, specially on the subject of alienation and the connection between idealism and religion. He was extremely critical of the idealist nature of Hegelian dialectics. His criticism had a revolutionary impact, and helped to shape the ideas of Marx and Engels. Unfortunately, Feuerbach ultimately failed to live up to his promise. His main mistake was, to use the German expression, to throw the baby out with the bath water. In rejecting Hegel's philosophy he also rejected its rational core—dialectics. This explains the one-sided character of Feuerbach's materialism, which caused its downfall.

At the centre of Feuerbach's philosophy is man. But Feuerbach takes man, not as a social being but as an abstract individual. He regards religion as the alienation of man, in which human traits are made objective and treated as a supernatural being. It is as if man suffers from a kind of split personality, and contemplates his own essence in God. Despite its limitations, The Essence of Christianity still retains considerable interest, for its brilliant insights into the social and historical roots of religion. Ultimately, however, his conclusions are extremely weak. His only alternative to the domination of religion is education, morality, love, and even a new religion.

Marx and Engels were disappointed by Feuerbach's reluctance to draw all the conclusions from his own ideas. Feuerbach was persecuted savagely by the authorities, dismissed from the university in 1830, he spent his last years a tragic and virtually forgotten figure in an obscure village. The revolution of 1848 consigned the ideas of Feuerbach and the Hegelian left to oblivion. Ideas which had seemed radical before now appeared irrelevant. Only the revolutionary programme of Marx and Engels stood the test of fire.

Feuerbach did not understand the revolution, and remain aloof from the new movement founded by Marx and Engels, although at the end of his life he joined the German Social Democratic Party. Feuerbach's most important role was to act as a catalyst for the new movement. Somebody once remarked that the saddest phrase in any language is "might have been." This is more true of Feuerbach than any other philosopher. Having spent the greater part of his life in the wilderness, in the end, his destiny, like a philosophical John the Baptist, was to prepare the way for others.

Chapter Six
Philosophy in the 20th Century

Philosophy in our time enters into a phase of irreversible decline. In all the trends of modern Western philosophy, one looks in vain for a single idea that has not been expressed long ago, and far better by others. Bourgeois philosophy has withered on the vine. It has nothing new or meaningful to say. For that very reason, it is justly subject to universal contempt, or, more accurately, indifference.

Here again the baneful effects of the extreme division of labour make themselves felt with a vengeance. Isolated in their ivory towers, the academics pass their lives writing obscure theses which are read, and sometimes answered, by other academics. Few people understand what they write. Fewer still care a damn. Like some antiquated priest-caste with its own secret language, comprehensible only to the initiated, they resort to all kinds of symbols and jargon, which seems deliberately designed not to be understood. Here, however, the comparison ends. The mysterious utterances of the priests were taken in deadly earnest by most people. Now the only ones who pay the slightest attention are other philosophers, who, after all must earn a living somehow or other.

Long ago, Joseph Dietzgen said that official philosophy was not a science, but a safeguard against socialism. No matter how indignantly they deny it, professional philosophers have been enlisted by the defenders of the status quo as allies in the struggle against Marxism. This was particularly blatant in the period of the Cold War, but it still remains true. There is nothing new in this, either. Ever since Marxism emerged as a significant force, challenging the existing order, the Establishment has declared war on every aspect of Marxist ideology, starting with dialectical materialism. The very mention of Marxism is guaranteed to provoke a knee-jerk reaction in such circles. "Out of date," "unscientific," "disproved long ago," "metaphysics," and all the rest of the threadbare and tiresome litany.

Not only are Marx and Engels persona non grata in the hallowed halls of the philosophy department, but poor old Hegel, who was once hailed as the philosopher’s philosopher par excellence, is subjected to a quite shameful conspiracy of silence. This situation is not only a reflection of material interests, which soon convince all but the bravest souls that it is not wise to offend those who provide the grants and control careers. It is also that they do not like to be reminded of the fact that there was once a time when philosophers actually had something profound and important to say about the real world.

Main Trends

If we leave aside a few mavericks, such as Henri Bergson, John Dewey, George Santayana and A. N. Whitehead, the great bulk of modern Western philosophy falls into just a couple of categories. On the one hand we have the subjectivist schools related to existentialism, on the other, the various brands of "logical positivism," including linguistic philosophy. The former trend has, in general, had more of an echo in the Latin countries, especially France. The latter, until quite recently, enjoyed widespread support in the Anglo-Saxon world. We shall devote most of our attention to it, because of its

pretension to represent the philosophy of science. The trend which dominated philosophy in Britain and the United States for the greater part of the 20th century, has appeared in different disguises, and under all kinds of aliases—neo-positivism, logical empiricism, empirio-criticism, analytical philosophy, etc., etc. Although it rose to prominence in Britain and the USA, it owes a great deal to German and especially Austrian philosophers. About the turn of the century, the physicist Ernst Mach was developing his philosophy of empirio-criticism. Mach, argued that it was impossible to prove the existence of the material world.

To most people, this idea may seem, to put it mildly, a bit peculiar. And so it is. Yet it has enjoyed considerable popularity with philosophers for most of this century. It is not, however, a new idea. It is based on the ideas worked out by Bishop Berkeley in the 18th century. This was the worst kind of subjective idealism, and the neo-positivists are not very pleased to be reminded of the real author of their philosophy. They regard themselves as scientific empiricists. But then, Bishop Berkeley's ideas were ultimately derived from the narrow British philosophy of empiricism, based on Locke's idea that all human knowledge comes from our senses.

Since all knowledge is derived from sense-perception, he argued, can I assert, for example, that this apple exists? Not at all. All I can say for certain is that I see it, smell it, taste it, etc. In other words, all that I can know is my sense-impressions. Despite all claims to the contrary, the inevitable conclusion of this line of thought is that only I exist. This view is known in philosophy as solipsism (from the Latin solo ipsus—"I alone").The argument that it is impossible to prove the existence of the physical world was answered by Engels as long ago as 1892, when he wrote, in the Introduction to the English edition of Socialism Utopian and Scientific:

"Again, our agnostic admits that all our knowledge is based upon the information imparted to us by our senses. But, he adds, how do we know that our senses give us correct representations of the objects we perceive through them? And he proceeds to inform us that, whenever he speaks of objects or their qualities, he does in reality not mean these objects and qualities, of which he cannot know anything for certain, but merely the impressions which they have produced on his senses. Now, this line of reasoning seems undoubtedly hard to beat by mere argumentation. But before there was argumentation there was action. In Anfang war die Tat ('In the beginning was the deed,' from Goethe's Faust, Part I, Scene III.) And human action had solved the difficulty long before human ingenuity invented it. The proof of the pudding is in the eating. From the moment we turn to our own use of these objects, according to the qualities we perceive in them, we put to an infallible test the correctness or otherwise of our sense-perceptions. If these perceptions have been wrong, then our estimate of the use to which an object can be turned must also be wrong, and our attempt must fail. But if we succeed in accomplishing our aim, if we find that the object does agree with our idea of it, and does answer the purpose we intended it for, then that is positive proof that our perceptions of it and of its qualities, so far, agree with reality outside ourselves." (MESW, Vol. 3, p. 101.)

Materialism and Empirio-Criticism

Mach's basic argument—echoing the ideas of Berkeley—was that "I interpret the world

through my senses." A materialist would add to this "the world exists independently of my senses." Failure to accept this elementary truth immediately lands us in all kinds of absurdities—for example, we would have to admit that the world did not exist before there were people present to observe it. More correctly, it did not exist before I was present to observe it, since all I know is my own senses, and therefore I cannot be certain that anyone else exists. In fact, it would follow from this madness that if I close my eyes, the world disappears! Sounds crazy? So it is. Yet not only philosophers, but some very respectable scientists have adopted views which are quite close to these. Let us recall that Mach himself was a physicist.

Mach's arguments were completely answered by Lenin in his book Materialism and Empirio-Criticism, where Lenin explains that: "Matter is a philosophical category denoting the objective reality which is given to man by his sensation, and which is copied, photographed and reflected by our sensations, while existing independently of them." (Lenin, Collected Works, Vol. 14, p. 130.) Marx and Engels had already clarified this point: " Indeed, being is always an open question beyond the point where our sphere of observation ends. The real unity of the world consists in its materiality, and this is proved not by a few juggling phrases, but by a long and laborious development of philosophy and natural science." (Engels, Anti-Dühring, p. 54, our emphasis.) As a matter of fact, it was already dealt with by Hegel, who pointed out that "In the language of common life we mean by objective what exists outside of us and reaches us from without by means of sensation." (Hegel, Logic, p. 67.)

The fundamental error of Mach, which is derived from Hume and Kant, was to regard the senses as a kind of barrier separating the individual (the subject) from the material world (the object). In reality, the senses themselves cannot exist without a nervous system, a brain, a body, food, and therefore a physical environment. To present the senses as if they were something independent and separate from the body, i.e. matter organised in a certain way is idealist nonsense of the worst kind. It has nothing in common with science, and everything in common with religion and spiritualism.

Thought is nothing but matter that thinks. It is the product of matter organised in a certain way. Thus, man is part of nature, but a very special part, characterised by the capacity to reflect and comprehend the rest of nature. One of the most striking contradictions of subjective idealism is this: if the physical world only exists if it is perceived, how could it have existed before the existence of the human race, or life itself? Although they twist and turn, the logical positivists, right up to the present, are unable to provide a satisfactory answer to this elementary question.

"That is what comes of accepting 'consciousness,' 'thought,' quite naturalistically as something given, something opposed to being, to nature, from the outset. If this were so, it must seem most odd that consciousness and nature, thinking and being, the laws of thought and the laws of nature, should so closely correspond. But if we then ask what thought and consciousness are and whence they come, we find that they are products of the human brain and that man himself is a product of nature, who has developed in and along with his environment; whence it is self-evident that the products of the human brain, which in the last analysis are also products of nature, do not contradict the rest of nature's interconnections but correspond to them." (Engels, Anti-Dühring, p. 44.)

And Lenin, dealing with the same subject, writes:

"For every scientist who has not been led astray by professorial philosophy, as well as for every materialist, sensation is indeed the direct connection between consciousness and the external world; it is the transformation of the energy of external excitation into the fact of consciousness. This transformation has been, and is, observed by each of us a million times on every hand. The sophism of idealist philosophy consists in the fact that it regards sensation as being not the connection between consciousness and the external world, but a fence, a wall, separating consciousness from the external world—not an image of the external phenomenon corresponding to the sensation, but as the 'sole entity.'" (Lenin, Collected Works, Vol. 14, p. 51).

The question of the reality or non-reality of the world outside us is, in fact, not a philosophical but a practical question. It is not solved in the study, but through the entire experience of the human race in its struggle to dominate and transform the real conditions of its existence, and, in so doing, to transform itself also. This was very well expressed by Marx in the second of his Theses on Feuerbach:

"The question whether objective truth can be attributed to human thinking is not a question of theory but is a practical question. In practice man must prove the truth, that is, the reality and power, the this-sidedness of his thinking. The dispute over the reality or non-reality of thinking which is isolated from practice is purely a scholastic question." (MECW, Vol. 5, p. 3.)

Reaction Against Hegelian Idealism

In Britain, the dominant philosophy in the universities in the second half of the 19th century was, oddly enough, Hegelianism, which was presented in a suitably mystical and religious manner. Empiricism is a deeply-rooted tradition in the Anglo-Saxon world. Russell and G. E. Moore reacted against the vapid idealist caricature of Hegelian philosophy represented by the likes of Bradley, McTaggart and Stirling, the author of The Secret of Hegel (of which Lenin remarked that "The secret was well kept!"). These idealists taught a bowdlerised version of Hegel, omitting all of value, and preserving only the mystical side. McTaggart, for instance, taught that the concept of time is inconsistent and therefore cannot be exemplified in reality. Such mystical twaddle repelled a whole generation of younger philosophers, such as G. E. Moore and Bertrand Russell.

This started as a healthy reaction against idealist mystification. But what to put in its place? They searched around for an alternative, and found a good old British one—"common sense" and "the facts." They advocated a return to empiricism, in an attempt to purge idealism from philosophy. Their watchword was that of Isaac Newton: "Physics, beware of metaphysics!" In place of wrong-headed idealist theorising, empiricism prefers no theorising at all. Regrettably, that is not possible. Philosophy, like nature, abhors a vacuum.

The only viable alternative to metaphysics is consistent materialism—dialectical materialism. By ignoring the philosophical revolution effected by Marx and Engels, who had stripped the Hegelian philosophy of its idealist trappings to reveal its rational core,

they threw the baby out with the bathwater. They were thus obliged to return to an earlier standpoint which had already been completely overtaken and surpassed.

The line of development of the British empiricist school founded by Bacon, Hobbes and Locke entered into a prolonged decline with Berkeley and Hume, eventually ending up in a complete blind alley. The attempt of J. S. Mill to revive it was merely a lifeless vulgarisation. The fundamental proposition of empiricism is: "I interpret the world through my senses." To this self-evident proposition, it is necessary to add: "the world exists independent of my senses."

The senses are ultimately the source of all human knowledge. Equally, it is the source of many errors. At its birth, empiricism represents a giant leap forward in human thought. It marked a rejection of the dictatorship of the Church over science, and the victory of the genuine scientific method, based on experiment and observation, as opposed to the stultifying idealism of the Schoolmen.

But this materialism remained incomplete and one-sided. Above all, it fell prey to the prevailing mechanistic mode of thinking. It is a paradox that the greatest advances in philosophy were made by idealist philosophers like Spinoza, Leibniz, Kant and, above all, Hegel. This contradiction was solved by Marx and Engels, combining for the first time dialectics with the scientific method of materialism.

To his credit, G. E. Moore tried to oppose not only Hegelian mysticism, but also the mysticism that inevitably arises from a one-sided empiricism. The example of Berkeley and Hume shows where this leads—to the morass of subjective idealism and solipsism (the idea that only "I" exist). In his paper The Nature of Judgment (1899), Moore argued for a theory of knowledge that accepts the existence of the physical world independent of the senses.

In his 1925 essay Defence of Common Sense, he says: "I had breakfast this morning, (therefore time exists) and I do have a pencil in my hand (therefore the external world exists)." While this is preferable to the mystical nonsense of Mach and Heisenberg, it is hardly satisfactory. Such superficial arguments do not carry philosophy a single step forward from the time when Diogenes the Cynic "proved" the existence of movement simply by walking up and down. Within certain limits, "common sense" can stand on its own. But beyond that, it breaks down utterly, and leads to even more serious mistakes. Let us not forget that "common sense" tells us that the world is flat, and the sun goes round the earth.

Try as we may, we cannot do without theoretical generalisations which take us far beyond the world immediately given in sense-perception. Moore’s attempts to combat metaphysics by appealing to the "beliefs of common sense" are quite empty from a philosophical point of view. Why appeal to these beliefs, rather than any other beliefs? What this amounts to is an appeal to the commonplaces and prejudices of the society in which we live. Thus, at the end of the day, we once again find ourselves stuck with an essentially subjective philosophy, and moreover, one that is firmly rooted in the status quo.

"Logical Atomism"

Whereas Moore advocated a return to "common sense"—a typically Anglo Saxon response, not just to idealism but to any kind of theoretical thought which seems to conflict with the narrow world of experience—Russell was moving in an altogether different direction.

Russell and, at least at first, Wittgenstein, thought that the underlying structure of language mirrors that of the world, and that, therefore, the analysis of language would reveal important truths about reality. In fact, there is just a germ of truth in this idea, as Hegel pointed out long before. Here, however, it is presented in a narrow, one-sided way, which leads straight to a dead-end.

"Out of the frying-pan, and into the fire!" Russell differed from Moore in attempting to work out a new theory and methodology. How to put logic on a scientific basis? Why, by giving it a mathematical language. In 1918-19, under the influence of the brilliant young Austrian Wittgenstein, he published a series of articles entitled The Philosophy of Logical Atomism, in which he endeavoured to disclose the fundamental workings of language and thereby reveal the fundamental structures that language describes.

Wittgenstein, who had moved to Cambridge, initially shared the position of Russell and Carnap, but later became skeptical of the foundations of mathematics and logic and moved away, to a study of ordinary language. He advanced the idea that "all philosophy is a critique of language." His declared aim was to wage a "battle against the bewitchment of our intelligence by means of language."

This kind of thing is seriously put forward as the "final solution" for all the great philosophical problems of the past. Just tidy up your grammar and syntax, and all will be well! As if these problems were caused by some misunderstanding, or by not speaking correctly, or formal defects of thought. Now for the first time in 2,500 years, the great men of Oxbridge suddenly begin to think and speak with the necessary clarity, and quickly sort out all the confusions caused by muddleheads like Socrates, Aristotle, and, of course, Marx.

The theory of logical atomism is based on a completely false understanding of language. It is derived from a superficial analogy with the physics of the day. The simplest kind of statement is called "atomic," while more complex statement are given the label "molecular." By borrowing a few phrases from physics, Russell hoped to lend his assertions about language a scientific air. There is absolutely nothing scientific about it. Language is least of all susceptible to a "reductionist" treatment of this sort. It is a complex whole that is much more than the totality of its individual parts. Russell’s whole approach reflects the deficiencies, not only of his narrow and formalistic philosophy, but also the limitations of physics at that time.

There is nothing new even in the notion of linguistic philosophy. This was already present in the writings of Locke, Berkeley and Hume, let alone Hegel, who had some brilliant dialectical insights on language. The celebrated Tracticus of Wittgenstein is a good example of how these ladies and gentlemen tied themselves in knots with their

metaphysical speculations on language. According to Wittgenstein, we can only know the world through the empirical sciences, yet the Tracticus claims to reveal the relationship between language and the real world. The Tracticus actually says of itself that what it says cannot be coherently said. And these people accuse Hegel of obscurantism!

The Vienna Circle

After the First World War, a group called the Vienna Circle, led by Rudolph Carnap, with a flourish of trumpets, launched the school of logical empiricism, announcing to the world that "philosophy must be scientific." This has been the battle-cry of logical positivism ever since. It is alleged that this brand of philosophy is entitled to what amounts to a monopoly of the "scientific method."

All other philosophies, past and present, are sternly required to submit to the terms of the self-proclaimed philosophy of science, and, if they do not conform to its tenets, they are instantly declared to be unscientific, or even worse, metaphysical, and are cast into the outer darkness. Here, amidst wailing and gnashing of teeth, they can rub shoulders with the likes of Marx, Hegel, Freud, Aristotle, Spinoza, Saint Augustine, and all the host of obdurate metaphysicians, condemned for all eternity by the Supreme Wisdom of The Philosophy of Science.

Carnap started with perception (The Logical Structure of the World, 1928), then turned to semantics (The Logical Syntax of Language, 1934), and ended up with logic (Meaning and Necessity, 1947).

Ludwig Wittgenstein published his Tracticus Logico-Philosophicus in 1922, with the laudable intention of arriving at "clear thinking," (the clear assumption being that human beings were unable to think clearly before). But we have already had occasion to point out that one of the hallmarks of this tendency is its remarkable humility.

The basic ideas are as follows:

1) All meaningful discourse consists either of a) the formal sentences of logic and mathematics, or b) the factual propositions of the special sciences.
2) Any assertion that claims to be factual has meaning only if it is possible to say how it might be verified.
3) "Metaphysical" assertions, coming under neither of these classes are meaningless.
4) All statements about moral, aesthetic, or religious values are scientifically unverifiable, and therefore meaningless.

Thus, in a couple of lines, we effortlessly dispose of two thousands years of human thought. If it does not fit into the narrow straitjacket of the rules of logical positivism, it is declared to be neither right nor wrong, but simply meaningless. Compared to this, all the battles of Julius Caesar and Napoleon are just child’s play. God and the devil, dialectical materialism, psycho-analysis, the writings of Plato and Aristotle, of Spinoza, the Bible, the Koran and the Torah are dismissed, with no trouble at all.

After the rise of Hitler, Carnap and his collaborators moved to the USA, where their ideas were influential. But everywhere, the different brands of logical positivism have led to a

blind alley. Bertrand Russell started with logic, then turned to problems of perception, and finally ended up with semantics, a barren playing with words and symbols.

The declared intention was to purge philosophy of Metaphysics in general. But the way to a very warm place is paved with good intentions! What was so cavalierly ejected by the tradesman’s entrance immediately flew back in through the window. Instead of combating idealist metaphysics fairly and squarely (which can only be done by adopting a consistent materialist standpoint, the only really scientific methodology), they resorted to a kind of philosophical subterfuge. "We cannot know, so we should not ask," ("the question has no meaning"). At best, this leads to agnosticism, shamefaced, inconsistent materialism. At worst, it leads straight into the morass of subjective idealism.

The first thing that strikes one here is the extreme poverty of thought, the narrow formalism, the absence of real content, the intellectual cowardice of this whole outlook. Do we really have to remind ourselves that all the advances of human thought, and especially of science, were made by great thinkers who were spurred on by the challenge of the unknown, who were not afraid to ask questions which could not be answered at that moment in time. How could the brilliant theories of the Greek atomists be "empirically verified" with the technology available at the time? We can imagine the ancient Greek counterparts of these philosophers of science scoffing at the "meaningless metaphysics" of Democritus and Epicurus!

Logical Positivism

It is customary for the opponents of Marxism to have a good laugh at the numerous splinter groups on the political left. But the situation is not much different with the squabbling groups which emerged from logical positivism. Nevertheless, it is very much a question of the same tune played on different keys. In Britain, they were based at Oxford, where G. E. Moore represented a typically English trend based on a "realistic and commonsensical" approach to ethics and the theory of knowledge.

In the early years of the 20th century, Bertrand Russell and Alfred North Whitehead, reacting against the prevailing pseudo-Hegelian idealism in a different way, set out to develop a "new logic," in a work published in 1910-13, which they modestly gave the same name as Newton’s epoch-making masterpiece Principia Mathematica. "The origin of this philosophy is in the achievements of mathematicians who set to work to purge their subject of fallacies and slipshod reasoning." (Bertrand Russell, History of Western Philosophy, p. 783.) This kind of boastful language is all too typical of the whole trend of logical positivism, which, just like Dühring promised a great deal, and delivered practically nothing.

Here reality is stood on its head. The world must be understood by analysing ideas, or, worse still, words. Here we are back with the same old mysticism of Mach’s empirio-criticism, which Lenin had demolished in 1908. Russell twists and turns on the central issue of whether physical objects exist outside our senses. At one point, he claimed that the observer had to infer the existence of a material world as the best available hypothesis to account for his experiences. Elsewhere he argues that physical objects could be taken as logical constructions out of sense-data.

This obsession with language is no accident. It fits in well with the deeply ingrained prejudice of the intellectual that reality is equivalent to ideas and words. It requires an effort of the imagination to remember that the period under consideration was one of unprecedented social upheaval. A world war with millions slaughtered, the Russian Revolution, economic crisis, the miners' strike in Britain. And in Oxford and Cambridge? Thick tomes on the meaning of words, and attempts to create a "perfect" language. A retreat into the rarefied atmosphere of syntax, the breakdown of language into its "atoms," perhaps in an attempt to make sense of a senseless world. Better still, deny its existence altogether! That was the way of the Greek and Roman skeptics, of mediaeval monks, of Bishop Berkeley, and now of the self-appointed philosophers of science. Was there ever in the whole history of philosophy such a comically misnamed piece of pretentiousness?

There is a common thread connecting all these schools. It is the exaggerated importance given to language. "In the beginning was the Word," wrote John the Evangelist, at the beginning of his gospel. This has been taken by logical positivism a its rallying call, with one slight amendment: not just in the beginning, but in the middle and the end as well! It's all a question of words. This is entirely in consequence with the psychology and prejudices of people who live by words, written or spoken. A soil without nutrients will produce only feeble plants. An anaemic environment will only bring forth a bloodless philosophy. All this semantic fiddling and fussing for decades was supposed to represent philosophy. As Hegel once commented: "By the little with which the human spirit is satisfied we can gauge the extent of its loss."

Note that, by reducing everything to words and their meaning (semantics), we have by no means escaped from idealism. What are words if not expressed thoughts? This alleged "scientific realism" is, in fact, a resurrection of idealism in another disguise. The appeal to language, merely moves us one step further away from the material world, so that, instead of asking whether a particular idea corresponds to reality, we now confine ourselves to asking whether a given word or phrase corresponds to the idea we wish to express!

Here again, we see how all the riches of philosophy are reduced to a few desiccated crumbs. Without for a moment denying the importance of the study of language and meaning as a specialised branch of science and philosophy, to attempt to reduce everything to this is frankly absurd. This empty and arid philosophy was followed in the USA by Gilbert Ryle, J. L. Austin, P. F. Strawson and others.

The only "innovation" here in comparison to Mach is the introduction of the linguistic dimension. This does not signify any real advance, but merely pushes the whole argument one step further away from reality. Instead of asking whether a given idea is correct or not (that is to say, whether it reflects objective reality) we are only allowed to ask whether a given statement is meaningful or not. And how do we know whether we are saying something "meaningful"? By the definitions arbitrarily invented by the logical positivists themselves! This is like playing a game of football, where the rules state that only the other team is allowed to score goals, or, more accurately, make up the rules as they go along. It reminds one of the logic of Humpty Dumpty in Alice in Wonderland: "When I use a word it means just what I choose to mean—neither more nor less."

All statements must be empirically verifiable (the "principle of verification"). Thus, expressions like "God exists" are meaningless, because they can neither be proved or disproved. The same is said of most of the great central problems of philosophy, including the struggle between idealism and materialism. These are declared to be "non-problems." And, as in the rules of cricket, "the umpire's decision is final." Thus we dispose of the whole history of philosophy, without even removing our carpet slippers!

"But wait a minute!" comes a shout from the back of the lecture-hall. "Haven't you forgotten something? It's all very well disposing of God, Karl Marx and a few other notorious trouble-makers. But what about the eternal truths of mathematics? How on earth can we empirically verify Euclid's geometry? We all know that the axioms of mathematics are not proven, but have to be taken on trust. And things are just as bad with logic itself! How do we empirically verify the law of identity, when quantum mechanics seems to prove something altogether different?"

At this precise moment, the neo-positivist lecturer looks at his watch, and decides it is time for lunch. He cannot very well answer his na•ve student, because the so-called truths of mathematics and formal logic cannot be empirically verified at all. They are what is known in the trade as a priori (from the Latin, meaning "from the beginning"). They are simply taken to be true at the outset. Thus, if we are to be consistent, not only Marx and Freud have failed the principle of verification, but Pythagoras and Euclid also. All should be renounced as pernicious metaphysicians, deceiving us with their unverifiable nonsense. So not only dialectical materialism ends up on the scrap-heap, but the whole of mathematics and formal logic as well!

Here the Tracticus hastens to the rescue with a barely-hidden trick. As in the kind of insurance policies sold by some of the less reputable salesmen to gullible clients, you have to read the small print, which contains an escape-clause: the truths of mathematics are declared to be "analytic" (a term filched from Kant). They are true, but tautologies (truisms) like the sentence "all bachelors are unmarried." They are conventional truths which underlie the use of the symbols involved. Make whatever sense you can of this!

What it really means is that, when faced with the insoluble contradictions of their own arguments, these "practical," "commonsensical," "scientific" gentlemen do not hesitate to resort to blatant trickery to cover their backsides. And all because of a dogmatic insistence that all truths must be derived from empirical knowledge! To which a dialectical materialist would reply, "Yes, but only in the last analysis." The history of thought is a very long one, and has acquired a life and logic all of its own, like the broomstick of the sorcerer's apprentice.

The laws of formal logic, like those of dialectics, are abstractions which are ultimately derived from nature. But, having once arrived at these important generalisations, is it really necessary for every generation, or individual, to rediscover them by trial and error ("empirically")? Do we need to re-invent the wheel? If the answer is no, then we must accept that not all knowledge is derived directly from experience; that the historically evolved forms of thought not only have a role to play, but a most important one. The only question we have to ask is whether these forms of thought (dialectics, formal logic) adequately reflect the objective world or not. Of course, if, like the philosophers of

science, we have problems deciding whether the objective world is out there or not, then the whole thing gets a bit awkward.

"Analytic Philosophy"

Deeper and deeper into the tangled undergrowth of syntax, they moved further and further away from reality, to the point where most present-day "analytical philosophers" now deny that language mirrors the objective world at all. They have spent so long floating around the rarefied heights, that they have now decided that the language of ordinary mortals is just not good enough. They have even proposed the creation of an "ideal" language, which will be pure, precise, and free from all ambiguity. No doubt, quite useful work can be done on linguistic analysis. But to claim that this is the key to all the fundamental problems of human thought is indeed a slight misunderstanding.

At bottom, the crisis of modern science is connected with the extreme division of labour. The sharp dichotomy between those sections of science which take as their point of departure the real world, experiment and practice, and the so-called "deductive" and "a priori" sciences—maths and logic. The tendency of theoretical physics and cosmology to depend increasingly on complex mathematical theories has made it increasingly inadequate to explain the real world.

A revolution in logic is demanded by the entire situation. But for all their semantic investigations and abstruse symbols, no revolution has emerged. The logical positivists merely warm up the same old dishes, with a slightly different garnish. Expressing the same old ideas in abstruse symbols borrowed from mathematics does not give them any greater validity. The only real outcome has been to increase still further the gulf separating the scientific priest-caste from the "common herd."

Philosophy finally takes its revenge on those who tried to ignore her. Those who insisted on the "facts," and heaped curses on the head of "metaphysics," religion, and all the rest, are themselves responsible for re-introducing religion and mystical ideas into science. All the abstruse investigations into language and syntax, the search for an "ideal" language, for a world of mathematical symbols, and the rest of it, signifies an ever-accelerating slide away from the world of reality, into the most crass idealism.

Formal logic and mathematics establish a series of a priori rules (axioms, theorems, etc.), out of which everything else is derived by a process of deductive reasoning. Language develops in an entirely different way. The real, historical development of language does not conform to this method in the slightest degree. Any attempt to make it conform to such narrow and arbitrary parameters is doomed in advance. Grammar, vocabulary, and syntax evolve historically, as the result of an extremely complex interplay of different phenomena: social, economic, political, national, religious, cultural, etc. These are not logical constructs, but are socially determined. Insofar as they have rules, these are of an entirely different character to the rules of formal logic and mathematics.

Dead rules cannot give life to words. Moreover, the rules themselves have to be explained. In general, this obsession with words and language merely removes us one step further away from the real subject of our inquiry, which is material reality. No matter

where we start, we find ourselves discussing something else altogether, namely, "what do you mean when you say A, B, C..." and so on ad infinitum, like a man who tries to quench his thirst by drinking salt water. Even insofar as it is valid (and the inquiry after the meaning of words is certainly a useful exercise), it does not get us very far in the real task in hand, and more often has exactly the opposite effect, recalling the interminable and sterile discussions of the mediaeval Schoolmen on how many angels can dance on the head of a pin.

This road eventually brings us back to subjectivism, very well exemplified by the theory of a "private language" put forward by Russell and Moore. What each individual "knows," according to this, is not the objective world, but only his own sensations, ideas and volitions. These are not physical, but mental phenomena. The things "known" are essentially private and individual, that is, inaccessible to others. Now this flies completely in the face of everything that is known about the development of language. Language is a social phenomenon. Historically, it arises out of the demands of collective, co-operative production. The very idea of a "private" language is a contradiction in terms. It is an extreme manifestation of the idea of "atomism," transferred from physics to language, and from language to society.

If this were the case, how could the physical world be known and expressed at all? In effect, here we have the trivialisation of philosophy, its reduction to commonplaces, or investigations into this or that detail. This senseless and futile theory shows clearly that what the linguistic philosophers understood least of all is—language.

Blind Alley of Linguistic Philosophy

"I am tempted to say of metaphysicians what Scalinger used to say to the Basques: they are said to understand one another, but I don’t believe a word of it." (Nicolas-Sebastien Chamfort, Maximes et Pensees, ch. 7.)

In 1929, Wittgenstein returned to Cambridge from Austria, and promptly did an about-face from the positions he had previously put forward in the Tracticus. Opposing the ideas of logical atomism which he had earlier defended. Thus we have a curious split between the earlier and the later Wittgenstein. Dropping all pretence to represent a "scientific system," he now resorted to loose remarks and unconnected paragraphs, which suggest disorientation, rather than a system of thought. Here we have isolated pronunciations about the philosophy of mathematics, ethics, aesthetics, and much besides.

It was undoubtedly a positive thing that he dropped the untenable idea that language is a simple affair, which can be reduced to a rigid set of rules. Language can be used for the most varied purposes, which cannot be determined by a handful of a priori principles. Russell (and the early Wittgenstein of the Tracticus) took symbolic logic as the model for the underlying structures of language. In fact, formal logic and mathematics are thoroughly bad models for language.

Locke held that, in order to express an idea meaningfully, it is necessary to have in mind a rule for applying it correctly. Wittgenstein pointed out, against this, that a rule by itself

was dead. It was like a ruler in the hands of one who had never learnt to use it, a mere string of words. Rules cannot compel, or even guide, a person unless he or she knows how to use them; and the same is true about mental images, which have often been thought to provide the standard for using linguistic expressions.

Wittgenstein argued correctly that:

a) What transpires in the mental life of an individual could only be conveyed in a language that this person alone could understand.
b) Such a "private" language would be no language at all.
c) It is impossible to say anything about this "private" language, since, by definition, it cannot be talked about in a language accessible to anyone but the person concerned.

His later work shows a process of disintegration, consisting of unconnected aphorisms, some useful insights, but lacking any overall view. This was not really a "school" at all. Although some consider themselves "Wittgensteinians" (G. E. Anscombe, Norman Maleon, etc.), it consists mainly of appeals to "common sense," "everyday language," and so on.

The attempts to make language conform to the rules of formal logic can, within certain limits, help to produce a clearer mode of expression. But language is an immensely rich, varied and powerful instrument which has evolved over millions of years. It cannot adequately be reduced to the narrow limits prescribed by formal logic, an extremely limited and ultimately unsatisfactory mode of thought. It is typical of the one-sidedness of this logic that in the formal language worked out by Russell and Whitehead in their Principia Mathematica that it admits only statements which are true or false. "Let your communication be Yea, yea; Nay nay, for whatsoever is more than these cometh of evil."

Now even everyday language is not as restricted as this, and would soon rebel against any attempt to imprison it in such a narrow cell. In our normal speech, we do not limit ourselves to simple "yes" and "no" statements, but we also ask questions, issue commands, make (and break) promises, express beliefs (not all of them logical). We talk about possibilities, probabilities as well as certainties. In addition, there is a whole gamut of expressions expressing feelings and emotions, which may not be written as a mathematical equation, but which certainly play a most important role in the lives of real men and women. A moment’s reflection will suffice to expose the arbitrary, superficial, in short, nonsensical, nature of the whole construction.

Other philosophers have attempted to make good these deficiencies, by developing new and various "systems of logic." But none of them have been prepared to grasp the nettle, tackling the essential defect of formal logic, which lies in the basic laws themselves. One group of logicians have rejected the law of the excluded middle (A is not B). That is an advance, but still does not go far enough. Nor is any real advance possible until it is admitted that the law of identity (A = A) is itself defective, as is the so-called law of contradiction (A is not not-A), which is supposed to be deduced from it.

To be fair to Wittgenstein, having helped Russell in his attempt to force language into his arbitrary system, he subsequently concluded that the whole approach was false, even

from the standpoint of how language itself works. Language is a highly complex phenomenon, in which apparently similar statements express a myriad of different—even contradictory—meanings. This was already pointed out by Hegel in The Science of Logic. The detailed study of language is itself a vital task for modern science, closely connected with information technology and the whole question of "artificial intelligence." But it cannot succeed if it is restricted to an abstract study of the structure of language, separate and apart from the study of psychology, physiology, the workings of the brain and the nervous system, and the material world and society which alone imbue the sounds made by our vocal chords with real content and meaning.

The study of language is not purely a question of the structure of sentences. It is necessary to study the social and historical basis of language. Wittgenstein correctly observed that the limits of one's language are the limits of one's world. The Inuits (Eskimos) have many more words for snow than in any other language, and therefore a much more precise classification of this subject. This is a reflection of their practical mode of existence and economy. For these people, the varieties of snow are a question of vital importance for hunting, and therefore, survival. Similar examples can easily be found in all languages.

Language is the product of a long period of social development. Its content and forms have been repeatedly transformed, and it is still evolving. The attempt to force upon this extremely fluid and complex phenomenon an arbitrary "logical" straitjacket is, in the best case, restricted and oversimplified, and in the worst, the source of a huge number of philosophical blunders. Language does not operate according to a rigid and simple set of rules. The very attempt to make it do so has only served to reveal the impossibility of such a task. What was supposed to be simple and straightforward has turned into its opposite—a highly complex and contradictory thing.

The school of logical empiricism, represented by Carnap, Reichenbach and others, form part of the general tendency of logical positivism. This is shown by the reduction of philosophy to the logical analysis of language, not just syntactical analysis (as in the 1930s) but also semantic analysis. Implicit in this is the idea that it is impossible to provide objective proof for the existence of the material world. They purport to offer an "empirical language of science," but this does not signify recognition of the objective world, only "purposive" forms of organising the data obtained by the senses. Nevertheless, this school represents a certain advance over the earlier positions. By moving away from sweeping philosophical generalisations, and concentrating on specific areas of research, it has made a positive contribution in some fields of logical research.

A. J. Ayer

"'There's glory for you!' I don't know what you mean by 'glory,' Alice said. 'I meant, "there's a nice knock-down argument for you!'" 'But 'glory' doesn't mean "a nice knock-down argument,"' Alice objected. 'When I use a word,' Humpty Dumpty said in a rather scornful tone, 'it means just what i choose it to mean—neither more nor less.'" (Lewis Carroll, Alice's Adventures in Wonderland.)

The most widely-read of the neo-positivists was A. J. Ayer. Whereas Wittgenstein's

writings are obscure treatises written for a few initiates, Ayer's Language, Truth and Logic (1936) and The Problem of Knowledge were written with a mass audience in mind. The basic postulate is that nothing can be learned except through the "methods of the empirical sciences." This boils down to the old empiricist argument that "I interpret the world through my senses." (cf. Locke's famous phrase: "Nothing is in the mind which was not first in the senses".)

Like Mach, of whom his entire position is merely a plagiarism, Ayer pretends to reject subjective idealism, but, in practice, he argues that we can only know sense-contents (Mach's sense-impressions), and therefore we cannot prove the existence of the physical world. In The Problem of Knowledge, he repeats, almost word for word, Mach's dishonest polemic against so-called na•ve realism (materialism). To this subterfuge, Lenin replied:

"The reference to 'na•ve realism,' supposedly defended by this philosophy, is sophistry of the cheapest kind. The 'na•ve realism' of any healthy person who has not been a inmate of a lunatic asylum or a pupil of the idealist philosophers consists in the view that things, the environment, the world, exist independently of our sensation, of our consciousness, of our self and of man in general. The same experience (not in the Machist sense, but in the human sense of the term) that has produced in us the firm conviction that independently of us there exist other people, and not mere complexes of my sensations of high, short, yellow, hard, etc.—this same experience produces in us the conviction that things, the world, the environment exist independently of us. Our sensation, our consciousness is only an image of the external world, and it is obvious that an image cannot exist without the thing imaged, and that the latter exists independently of that which images it. Materialism deliberately makes the 'na•ve' belief of mankind the foundation of its theory of knowledge." (Lenin, Collected Works, Vol. 14, p. 69-70.)

The logical contortions which are a constant feature of the writings of logical positivists reach the most bizarre proportions, as we see in the following extract from The Problem of Knowledge, where Ayer ties himself in knots, over the question of whether it is possible to prove that other people and their minds really exist. For example, if somebody else has a toothache, how do I know it? We apologise in advance for abusing the reader's patience, since, for our part, we have no doubt about their existence, or their ability to suffer considerable discomfort, on having to read the following lines. We can only plead as a mitigating circumstance that, if we were to omit it, people might think that we were making it all up!

"The suggestion is that if I say of myself that I am in pain I am referring to a feeling of which I alone am conscious; if my statement is true it may be that I also show certain outward signs of pain, but I do not imply that this is so: it is not part of what my statement means. Or even granting that it is part of what my statement means, it is not all that it means. But if I say of someone else that he is in pain, all that my statement is supposed to mean is that he displays signs of pain, that his body is in such and such a state, or that he behaves, or is disposed to behave, in such and such ways. For this is all that I can conceivably observe.

"An obvious objection to this thesis is that it entails that the statements which I make

about my feelings cannot have the same meaning for any other person as they have for me. Thus, if someone asks me whether I am in pain and I answer that I am, my reply, as I understand it, is not an answer to his question. For I am reporting the occurrence of a certain feeling; whereas, so far as he was concerned, his question could only have been a question about my physical condition. So also, if he says that my reply is false, he is not strictly contradicting me: for all that he can be denying is that I exhibited the proper signs of pain, and this is not what I asserted; it is what he understood me to be asserting but not what I understood myself." (Ayer, op. cit. pp. 214-5.)

The reason for these mental gymnastics is that Ayer knows that the inescapable conclusion of his own position is solipsism—the notion that only I exist. Lenin showed quite clearly in relation to Mach that logical positivism necessarily means a denial of the objectivity of the material world. There is no way round this. Like Mach, Ayer resorts to a subterfuge, pretending to polemicise against this position, which he calls scepticism, while simultaneously distancing himself from materialism (na•ve realism). He correctly says of scepticism that "...if the theory were correct, this distinction between the mental and the physical, between what is private and what is public, could not be made in any case but one's own...The picture which this theory tries to present is that of a number of people enclosed within the fortresses of their own experiences. They can observe the battlements of other fortresses, but they cannot penetrate them. Not only that, but they cannot even conceive that anything lies behind them." (Ibid., pp. 215-6.)

The fact that Ayer, just like Mach, tries to distance himself from these outrageous conclusions, does not change anything. From his philosophical point of view, he has no real arguments against the so-called sceptics. At the end of the day, he is reduced to appealing to "common sense," and belief in the existence of a physical world, other people, and the fact that there was a world before he, or anyone else, was present to observe it. None of this can be logically deduced from his own arguments, which are, in fact, far less consistent than the position taken by those who openly deny the existence of the objective world. The problem is that it is impossible to argue with lunatics, using the logic of lunatics.

Logic and Ethics

In the good old days before television, people used to read the kind of thriller novels where the hero is tied up, while the heroine awaits a fate worse than death. The reader bites his fingers, until he turns to the next chapter, where the great man is finally released with the famous phrase: "With one bound, he was free!"

When we get to the realm of moral philosophy, the situation of the philosophy of science gets about as desperate as the hero in the novel. Hume, the spiritual ancestor of this line of thought, argued that one cannot derive a conclusion about what ought to be from matters of fact. From the narrow standpoint of the verification principle, the whole of ethics must be written off as the most arrant nonsense imaginable. Philosophers have wracked their brains for many centuries over the definition of "good" and "bad." No matter! The philosophers of science can sort out all this mess in less time than it takes to say "empirical verification." All you have to do is to rule the whole lot out of order!

For thousand of years the question of the meaning of "the Good" has been discussed by the great philosophers, Socrates, Plato, Aristotle, Spinoza, Kant, Hegel. Finally, Marx and Engels showed that morality was not a supra-historical category, fixed for all time, but something that has evolved with society, and is ultimately determined by the existing social and economic order, reflecting definite class attitudes and interests. The historical relativity of morality is a closed book to the logical positivists. For them, morality is not a social relationship and a special, historically determined form of consciousness, but merely a question of—language! The analysis of this extremely complex social phenomenon, which has taxed the greatest minds for centuries, has now been achieved once and for all by simply reducing it to an analysis of words.

Instead of asking what morality consists of, and what it is based on in real life, they ask for a definition of moral judgments and terms. Displaying that modesty which is their hallmark, they invented a new and revolutionary word—"metaethics"—which was supposed to settle the whole affair. This is not a theory of ethics, but an abstract, scholastic conception, completely divorced from life. In place of a real study of the roots of morality, they endlessly argue about the meaning of words, hoping to derive some understanding of ethics by asking in what sense words like "good," "bad," "evil," and "duty" are used.

An incorrect method will inevitably give incorrect results. The philosophers of science attempted to approach morality from the standpoint of the natural sciences. In point of fact, the arbitrary criteria of logical positivism are generally useless in the physical sciences. How much more useless are they in the realm of morality! What epoch-making results did this method yield? Can good and evil be perceived by the senses? No. Can they be experimentally demonstrated? No. The conclusion is self-evident. These are unscientific, metaphysical pseudo-concepts, which no self-respecting philosopher of science would touch with a barge-pole.

The fact that these pseudo-concepts have played, and continue to play, a most powerful role in the life of society can only be explained by the perversity and ignorance of the human race, which, having heard the Word of the philosophers of science, stubbornly persist in the error of their ways, motivated by pseudo-concepts and fighting over pseudo-issues. Whereupon, the philosopher of science shakes his head, and returns to his study, where he closes the door firmly on a world that is not yet ready to hear the Message.

These are all value judgments, you see, and, as such, are "not necessary adjuncts to science," as mathematics and logic are. Furthermore, they cannot be verified either by definition or by linguistic convention. Problem solved, once more. Or is it? The trouble is that the overwhelming majority of human beings persist in seeing some things as good, others as bad. They are so convinced of this that no matter how many times they are advised that these notions are unverifiable, they stubbornly persist in their belief. Worse still, it appears to govern all their actions, from the smallest to the most important, from buying a shirt to voting at election time. So what is written off by the philosophy of science as a meaningless irrelevance turns out to be quite a significant element of all social life, which still requires an explanation. In other words, a problem is not eliminated simply by declaring it to be a non-problem, any more than a predatory animal can be disposed of by the ostrich burying its head in the sand.

The standard view of logical positivism to morality is that it relates to feelings towards a given situation. Thus, the sentence, "One should not steal" simply means "I have a negative feeling about stealing." Thus morality is reduced to an entirely subjective state of mind on the part of the individual. How it comes about that millions of individuals come to possess exactly the same state of mind about the most varied subjects is a complete mystery. Even more mysterious is how these collective states of mind can change into their opposite, according to whether one lives under slavery, feudalism, capitalism, or tribal communism.

Our worthy logical positivist, having made his bed, must now lie in it. It is, however, a lot more roomy than before, since he has unceremoniously turfed out Logic, Mathematics, Ethics and Morality. But at least he has, in the process, also got rid of Religion and Metaphysics. Or so he thinks. Agnosticism is a way of avoiding the question of religion by treating it as a non-issue. Since it cannot be empirically verified, let's agree not to talk about it—just as polite persons agree not to mention disagreeable topics at the dinner-table. Unfortunately, religion is not a non-issue for millions of people in the world today, and cannot be disposed of so lightly. As opposed to religious fanatics and fundamentalists, agnosticism may be seen as a half a step in the right direction. But it is insufficient, precisely because it is only half a step, and therefore leaves ample scope for a return to all the old nonsense.

Although some of the present-day supporters of "Analytical Philosophy" probably consider themselves materialists, the problem concerning the difference between the mental and the physical still remained unresolved.

Increasingly, theories are elaborated without reference to the physical framework, as the result of deduction from given axioms—theorems, equations, etc. Worse still, the facts are forced to fit the theory. The Oxford school of "Analytical Philosophy" maintains that philosophy is an "a priori discipline" in which the philosopher is already in possession of the concepts he or she needs, and requires no observations for the purpose of analysis.

Like the bullfrog in Aesop's fable who puffed himself up until he went "pop," the pretensions of "Analytical Philosophy" have been exploded. Its proponents were to have solved all the problems of philosophy by merely getting to the roots of ordinary language and exposing the errors deriving from its misuse. Instead, they have merely piled confusion upon confusion, finally ending up in an inevitable dead end.

The Poverty of Popperism

"There is nothing so absurd but some philosopher has said it." (Cicero, De Divinatione.)

If it were not so serious, it would be comical. In the most pompous manner, the advocates of the most unscientific theory imaginable immediately elbowed aside all other trends and loudly proclaimed themselves to be the philosophy of science. It was the intellectual equivalent of gate-crashing a party. And, as sometimes happens, the people at the party may be too polite, or too afraid of a bunch of rowdies, to shut the door, so they just keep quiet and let them in. Of course, it always helps if someone on the inside calls out: "Oh, it's O. K., they're friends of mine!"

In the development of quantum mechanics, an important role was played by Niels Bohr and Werner Heisenberg. They worked together, and developed the so-called Copenhagen Interpretation of quantum mechanics, which we have already commented on. There was, however, a difference in their approach. Whereas Bohr was basically a pragmatic scientist, Heisenberg was always inclined to a more philosophical approach, and, for a time, accepted the theories of logical positivism. The whole Copenhagen Interpretation of quantum mechanics is permeated with the spirit of subjective idealism as a result.

It was bad enough that this trend should claim to speak for "modern science" in the field of philosophy. But that was not enough for them. They had to teach the scientists their business as well. If they were really the philosophy of science, then all scientists must heed them! They had worked out a "scientific method" which was foolproof. Now everyone must accept it, on pain of being denounced as unscientific. And in case anyone thought they were joking, just look at the job they did on psycho-analysis!

There was only one slight problem in all this. The standards of so-called logicality set by these ladies and gentlemen have nothing whatever to do with the actual practice of science itself. Most practical scientists just shrug their shoulders, and get on with their work as if these people were not there, just like those who move into the kitchen to get away from those noisy party-crashers; which does not prevent them from continuing to make an awful lot of noise.

One of the noisiest was Sir Karl Popper, who died recently. Like Napoleon, who literally crowned himself Emperor, Popper proclaimed himself the philosopher of science, and, without waiting for the outcome of a referendum on the subject, proceeded to hold court on a world scale. In between ferocious polemics against Marx (whom he did not understand), he wrote a great deal on the method of science (which he interpreted in a completely one-sided way). It is a measure of the vacuum in modern philosophy that this kind of nonsense was taken seriously for so long.

Induction Versus Deduction?

In 1934, Popper, then living in Vienna, published his book The Logic of Scientific Discovery. In this work, Popper completely rejects the method of induction, insisting that all conclusions must be drawn from logical deduction. Popper specifically rules out the method of induction, based on observation. To qualify for Popper’s certificate of "science-worthiness," a theory must be internally consistent, must not be a tautology, and must make predictions that can be tested. Moreover, he maintained that the results of a test cannot verify a theory, only falsify it.

All of this sounds very nice, and is in complete accord with the method of formal logic. But it has got very little to do with the actual practice of science. One physicist commented wryly that Popper’s ideas were strategically sound but tactically indefensible, in other words, fine in (formal logical) theory, but, like an umbrella full of holes—useless precisely for the purpose for which it was intended.

Induction (from the Latin inducere, to lead in) is another method of reasoning. It was already known to Aristotle, but achieved wide acceptance during the Renaissance, when

it was championed by Bacon and Galileo. As a form of reasoning, induction proceeds from single facts to general propositions. Men and women have always made such generalisations on the basis of their experience, often reaching correct conclusions, sometimes not.

Let us consider an example of inductive reasoning. A child burns its hand on a flame, and draws the conclusion, on the basis of experience that it is not a good idea to get too close to fire. "Fire (in general) burns." That is an inductive reasoning—from the particular to the general. In this case, the conclusion is perfectly valid and rather useful. But consider another example. A turkey is visited every morning by a nice old lady with a bag of corn in her hand. The turkey, by the method of inductive reasoning, might very well conclude that the kind lady means food. This conclusion is drawn from the same experience repeated many times—364 times, to be exact. Then, one morning, the farmer's wife appears with a butcher's knife in her hand. Here the turkey's inductive logic proves to be somewhat defective, and does not really help it to clarify its existential dilemma!

Scientific induction, like its popular equivalent, also consists of drawing conclusions from a whole class based on the number of elements of that class. But here the grounds for conclusion are provided by the discovery of essential connections between the elements studied, which show that the given feature must be possessed by the whole class. The task of discovering these necessary connections involves detailed observation. Thus, induction signifies experimental study of things, in such a way that we pass from single facts to generalisations.

The method of deduction is, on the face of it, the exact opposite of induction. Deduction consists of proving or inferring a conclusion from one or more premises by the laws of logic. The deductive method does not set out from particular experiences, but from so-called axioms, which are assumed to be correct from the start. This is the traditional method of mathematics, for example classical geometry, based on the axioms of Euclid, which were for centuries supposed to represent absolute truths, valid for all time, under all circumstances. Deductive reasoning therefore proceeds from the general (law) to the particular.

The struggle between induction and deduction goes back to the 17th century, to the different approaches adopted by two great scientific thinkers—Bacon and Descartes. The Englishman Bacon was the father of empiricism, and the method of inductive reasoning, which attempts to derive theories from observed facts alone. In Bacon's case, the obsession with observation proved fatal; he died of bronchitis as a result of an early experiment in refrigeration, involving stuffing a chicken with snow.

Descartes approached science from a diametrically opposite standpoint. Taking Euclid's geometry as his model, he attempted to develop consistent and coherent theorems derived from pure reason, without recourse to the unreliable evidence of the senses. His method was that of rationalism, which became the main tradition in France. Bacon's empiricism triumphed on the other side of the Channel. Both men, in different ways, advanced the cause of science, and both made important discoveries.

However, neither deduction nor induction on their own are capable of grasping the whole

picture. The problem with Bacon's method is that the facts do not select themselves. You need an initial theory (a hypothesis) even to decide what observations to make in the first place. Moreover, the results of induction always have a more or less provisional character. For example, a person who had observed a hundred swans might draw the conclusion that all swans were white. This is an inductive conclusion. But it would be wrong, because some swans are black. Engels makes the point that "The empiricism of observation alone can never adequately prove necessity." (The Dialectics of Nature, p. 304.)

We therefore did not have to wait for Sir Karl to point out the limitations of inductive logic. However, to deny induction altogether is to jump from the frying pan into the fire. Induction plays a necessary role in science, as well as in everyday life. Is it really necessary for somebody to drink all the water in the sea before being prepared to admit that sea water is salty? Popper's attempt to eliminate induction from science shows a lamentable ignorance both of the true relationship between deduction and induction, and of how science works in real life.

Until the end of the 19th century, the deductive method was used almost exclusively in mathematics. Not until the 20th century were attempts made to apply it to fields such as physics, biology, linguistics, sociology, etc. Despite all the impressive claims made on its behalf, experience shows that the axiomatic-deductive method is quite limited in what it can achieve. The controversy between induction and deduction is pointless, since, in practice, induction always exists together with deduction. Neither is self-sufficient as a method, but, in dialectical materialism, they are combined as different aspects of the process of cognizing reality, which are inseparably connected, and determine each other.

The Economist article already mentioned goes on to criticise Popper's rejection of the inductive method:

"A number of philosophers also question Popper's rejection of induction. The use of induction, they say, is logically unsatisfactory but inescapable. Deductions about the real world are only as good as the assumptions about the real world on which they are based. These assumptions rest on induction, as does the scientist's interpretation of the experimental results that test the conclusions drawn from them. Both in forming a hypothesis and in interpreting tests of it, a scientist makes the basic assumption that nature will behave in other places and at other times as it behaves here and now. That is an inductive assumption." And it continues:

"Dr. Jennifer Trusted is one British philosopher who puts induction in perspective. Induction, she says, is essential but not sufficient for knowledge of the real world. The same could be said for deduction."

This last observation is absolutely correct, and goes to the heart of the matter. Neither induction nor deduction, taken on its own, is sufficient. It is necessary to combine them, which is just what dialectics does. Deduction is also a conclusion, and therefore induction is also a kind of deduction. On the other hand, all deductions are, in the last analysis, derived from material reality. This is true even of axioms, which are supposed to be the products of "pure theory." For example, Euclid's axiom that a straight line is the shortest

distance between two points is clearly the result of long experience and observation. Engels explains the one-sidedness of both induction and deduction, when taken in isolation, and also explains the dialectical relation between them:

"Induction and deduction belong together as necessarily as synthesis and analysis. Instead of one-sidedly lauding one to the skies at the expense of the other, we should seek to apply each of them in its place, and that can only be done by bearing in mind that they belong together, that they supplement each other." (The Dialectics of Nature, p. 302.)

What Can we Predict?

Popper's insistence that all conclusions must be drawn by deduction, then, is at variance with the reality of scientific practice. Indeed, those areas of science—like certain branches of particle physics and cosmology—which have developed an excessive dependence on the method of deduction and abstract reasoning, are getting into a deeper and deeper mess. Nor is the business of the testing of a new hypothesis as straightforward as Popper makes out. There are many theories which are in daily use, despite the fact that they are known to be quite inadequate, for the simple reason that they are the best available; an example is Hooke's law, used by engineers to check the relationship between stresses and strains in a material.

In a very perceptive article (unfortunately unsigned) published in the Science section of The Economist in December 1981, Popper's views on science are exposed to a searching analysis, with quite devastating results:

"There are a lot of experiments where you cannot restrict the results to yes-or-no answers or where it is extremely hard to interpret what the answers are, because of the so-called signal-to-noise ratio. Suppose you repeat an experiment six times and get the result you predicted only twice. Does that prove the prediction was wrong? Or that four times out of six you failed to get the experiment right? In biology, such results are common: the vagaries of nature are notorious.

"While scientists strive for unambiguous answers, often they have to settle for less. And even if you do get results that unambiguously show the prediction of a theory is wrong, it is still not always clear what you have falsified. Strictly speaking, testing an isolated hypothesis is impossible. Consciously or unconsciously, the scientist assumes much else from the pyramid of knowledge besides the hypothesis tested." (The Economist, December 26th 1981, p. 101.)

The emphasis on prediction as a necessary precondition of the scientific method has been greatly exaggerated, and does not conform in the slightest to the reality of science. An astronomer can sometimes predict the position of a star many millions of years hence. But Darwin could not predict what species would evolve in a million years' time. Geologists cannot predict precisely the time and place of an earthquake. And with meteorologists, the situation is still more hopeless. Even with all the armoury of modern computers and satellite technology behind them, they can only predict the weather with any degree of accuracy for a maximum of three days. Incidentally, even astronomy is not such an exact science as used to be thought. There are plenty of unpredictable phenomena

in cosmology, yet no-one in their right mind would deny that astronomy is a science because it is unable to predict precisely where the next star will be born.

The reality of science certainly does involve making predictions to test out theories, although the nature of the prediction and the type of experimental "test" will vary enormously from laboratory test tubes to vast astronomical distances. Just because some predictions are not, and cannot be made, does not rule out the idea as a scientific method. There are sciences and sciences, and there are predictions and predictions. Predictions involving simple linear systems can be made with a high degree of certainty. But complex systems are difficult, or impossible to predict with any degree of accuracy.

For all the satellites and computers, it is impossible to predict the weather accurately more than three days in advance. Is meteorology a science, or not? Earthquakes cannot be predicted, and there are no neat laboratory experiments to prove the theories of geology. Is the latter a science, or is it not? And what about the predictions of a doctor? Even the best doctors make mistaken diagnoses, sometimes with fatal results. Is medicine a science? Clearly, it is, but not a precise science like some branches of physics.

When we reach a field like psychology, things get even more complicated. Psychology, as a science, is still in its infancy. One cannot yet speak of a fully worked-out body of ideas which is generally accepted in this most complex field, involving the basic driving-forces of human behaviour. And when we come to sociology, which, after all, deals with the complex behaviour of masses, the huge amount of variables makes the task of prediction doubly difficult. Difficult, yes. Impossible, no. For in human society also there are certain patterns of behaviour, certain processes, which can be identified and explained. General conclusions can be drawn, and, yes, predictions made, which can be tested in practice. Only don’t expect the same precise degree of accuracy in such predictions as you would hope to find in a carefully-conducted laboratory experiment!

At best, it is possible to predict the most general tendencies in society, and even these predictions must be constantly revised, added to and modified in the light of experience. In the end, they may be falsified by events, for a number of reasons, just as a even the best doctor’s diagnosis may turn out to be wrong. Does the doctor then draw the conclusion that diagnosis in general is an unscientific occupation, a waste of time? Or does he go back and try to discover the source of his error, in order to learn from it? The real question that should be asked is: Do we believe that it is possible to obtain a rational understanding of the laws that govern social evolution? If the answer is no, then all further discussion is pointless. If human history is seen as an essentially meaningless string of accidents, then there is no point in trying to understand it. But if science has succeeded in discovering the laws which governed the development of humankind in the remote past, based on the extremely scanty evidence of a few precious fossils, then it is not at all obvious why it should be impossible to uncover the laws which determined the evolution of our species for the last 10,000 years. Yet this is declared out of bounds by Professor Popper. All who attempt to do this will be immediately be condemned for the heinous crime of historicism.

Thus, we are entitled to ask about the far-flung galaxies, and the smallest particles of matter, but if we attempt to arrive at a rational understanding of society, of history—that

is to say of ourselves, who we are and where we came from—that is not allowed. The arbitrary nature of this prohibition is so glaring that one cannot avoid asking what the reason for it is. Is it really to do with science? Or might it have more to do with certain vested interests which do not want people to ask too many questions about the past and present of the type of society in which we live, for fear that they might draw all the wrong conclusions about the type of society we would like to live in in the future.

Nothing to Do with Science

Popper's attempt to elevate the rules of deduction and formal logic above all else is the 20th century equivalent to the dictatorship of the Church's one-sided and rigid caricature of Aristotle in the Middle Ages. Once again we have the attempt to force science into the straitjacket of a rigid and preconceived idealist schema, which lays claim to the status of an absolute truth to which everyone must bend the knee. Unfortunately, unruly, rebellious, contradictory nature will not submit meekly to such treatment. However self-consistent logic may be, it provides no ready-made answers about the world. Indeed, as we have seen, logic and mathematics in the 20th century has found it impossible to deal with contradictions even in its own house, as in the following sentences: "The next sentence is false. The previous sentence is true." Professional logicians cannot even agree among themselves whether this, and other "anomalies" have been resolved. Yet this did not prevent the likes of Sir Karl Popper from laying down the law for the whole domain of human thought.

The problem is that science, lives in the physical world, that crude world of contradictory, non-linear material reality. It is simply not good enough for the philosophy of science. Karl Popper is not a bit bothered about the discrepancy. If science does not match up to the stern criteria of the verification principle, so much the worse for science! Let us hear what the great man himself has to say on the subject:

"Science is not a system of certain, or well-established, statements; nor is it a system which steadily advances towards a state of finality. Our science is not knowledge (episteme): it can never claim to have attained truth, or even a substitute for it, such as probability.

"Yet science has more than mere biological survival value. It is not only a useful instrument. Although it can attain neither truth nor probability, the striving for knowledge and the search for truth are still the strongest motives of scientific discovery.

"We do not know: we can only guess. And our guesses are guided by the unscientific, the metaphysical (though biologically explicable) faith in laws, in regularities which we can uncover—discover. Like Bacon, we might describe our own contemporary science—'the method of reasoning which men now ordinarily apply to nature'—as consisting of 'anticipations, rash and premature,' and of 'prejudices.'" (Quoted in Ferris, pp. 797-8, our emphasis.)

These few observations, delivered in a typically modest style quite in the tradition of Herr Dühring, were made in a lecture delivered to the Aristotelian society in Oxford in 1936. The lecturer later recalled with some irritation that "the audience took this for a joke, or a

paradox, and they laughed and clapped." Evidently, they did not know their Karl Popper! There was no joke intended. He meant every word. For Popper and his disciples, the purpose of science is not to discover truths about the world, but merely a formal logical exercise, like chess or a crossword puzzle.

What is one to say about all this? At the end of the 20th century, when the discoveries of science have attained unheard-of peaks, we are informed that science cannot really know anything at all. On this issue, we completely concur with the following assessment:

"A distinction should be made between theories and facts. Scientists assume theories; they know facts to be true, within acceptable limits of confidence. As time advances, they replace one theory with another, arguably a better one. What should be beyond argument is that there is an accretion of known facts.

"On the whole, science is 'true.' To deny that man knows more about the workings of nature now than he did in the Middle Ages is perverse. Undoubtedly, some scientific discoveries are false and scientists are often a bit irrational in how they set about finding things out. But the alternative to accepting that there is a strong measure of truth in science is to go back to blaming a witch when the cow is sick." (The Economist, ibid., p. 103.)

The final refutation of Popperism and logical positivism in general is that, for all its bragging claims, it has nothing to do with the realities of science. This is shown by the attitudes of scientists, including, as we have seen, of those who could be expected to be sympathetic to it. This is what Niels Bohr had to say, after a conference of scientists and logical positivists held in Copenhagen about the philosophical implications of quantum mechanics:

"'For my part, I can readily agree with the positivists about the things they want, but not about the things they reject. All the positivists are trying to do is to provide the procedures of modern science with a philosophical basis, or, if you like, a justification. They point out that the notions of the earlier philosophies lack the precision of scientific concepts, and they think that many of the questions posed and discussed by conventional philosophers have no meaning at all, that they are pseudo problems and, as such, best ignored. Positivist insistence on conceptual clarity is, of course, something I fully endorse, but their prohibition of any discussion of the wider issues, simply because we lack clear-cut enough concepts in this realm, does not seem very useful to me—this same ban would prevent our understanding of quantum theory." (Quoted in T. Ferris, op. cit., p. 822, our emphasis.)

The famous physicist Wolfgang Pauli observed that the logical positivists merely used the term metaphysics as a kind of swearword, or at best, as an euphemism for unscientific thought. "I should consider it utterly absurd—and Niels (Bohr), for one, would agree—were I to close my mind to the problems and ideas of earlier philosophers simply because they cannot be expressed in a more precise language. True, I often have great difficulty in grasping what these ideas are meant to convey, but when that happens, I always try to translate them into modern terminology and to discover whether they throw up fresh answers." (Quoted in T. Ferris, p. 824.)

Finally, let us call as a key witness for the prosecution a man who might be expected to support the logical positivist line enthusiastically—Werner Heisenberg. In fact, he generally followed this line in the beginning, denying the independence of physical reality from the act of observation, insisting on the "indeterminateness" of processes at the sub-atomic level, and so on. However, as a scientist, involved in serious research, Heisenberg had to come to terms with the objective reality of the physical world. In the end, the absurd claims of the self-appointed philosophers of science were too much even for him.

"The positivists," he wrote, "have a simple solution: the world must be divided into that which we can say clearly and the rest, which we had better pass over in silence. But can anyone conceive of a more pointless philosophy, seeing that what we can say clearly amounts to next to nothing? If we omitted all that is unclear, we would probably be left completely uninteresting and trivial tautologies." (Ibid., p. 826.)

After decades of wandering in this arid desert, the most forward-looking scientists have finally turned their backs on a philosophy which taught them absolutely nothing either about the way nature works or how to understand it. The advent of the theories of chaos and complexity marks a decisive break with the narrow limitedness of the philosophy of science, and an approximation to a dialectical view of nature. The attitude of the new generation of scientists to the existing schools of thought is summed up in the following observations by the biologist Stuart Kaufmann on why he decided not to study philosophy:

"It wasn’t that I didn’t love philosophy. It’s that I distrusted a certain facileness in it. Contemporary philosophers, or at least those of the 1950s and 1960s, took themselves to be examining concepts and the implications of concepts—not the facts of the world. So you could find out if your arguments were cogent, felicitous, coherent, and so on. But you couldn’t find out if you were right." (M. Waldrop, Complexity, p. 105.)

There is an English proverb: "Little things please little minds." Those who place impossible demands upon science and then, when their demands are not met, draw the conclusion that science is not really "true" say nothing at all about science, but quite a lot about a trivial method which seeks simple answers to complex questions and complains when they are not forthcoming. The old claims to represent the philosophy of science are as dead as a doornail. To paraphrase what Marx once said about Matthew Arnold, the philosophy of science is too good for this world.

Existentialism

Existentialism has its roots in the irrationalist trend of 19th century philosophy, typified by Nietzsche and Kierkegaard. It has assumed the most varied forms and political colouring. There was a religious trend (Marcel, Jaspers, Berdyayev and Buber) and an atheistic trend (Heidigger, Sartre, Camus). But its most common feature is extreme subjectivism, reflected in its preferred vocabulary: its watchwords—"being-in-the-world," "dread," "care," "being towards death," and the like.

It was already anticipated by Edmund Husserl, a German mathematician turned

philosopher, whose "phenomenology" was a form of subjective idealism, based on the "individual, personal world, as directly experienced, with the ego at the centre."

For Karl Jaspers, the aim of philosophy was the "revelation of Being." Clearly religious and mystical.

Jean-Paul Sartre spoke of "Being and the threat of Nothingness," "Freedom of Choice," "Duty," and so on.

This expressed a certain mood among section of the intellectuals after the first world war in Germany, and then in France. What it indicates is the profound crisis of liberalism, as a result of "the Great War," and the upheavals which followed in its wake. They saw the problems facing society, but could see no alternative. A sense of impending doom, and a feeling of powerlessness and "Dread" fill these writings, accompanied by an attempt to seek an alternative on an individual basis.

Existentialism represents an irrational reaction against the rationalism of the Enlightenment and German classical philosophy—a rationalism now glaringly out of place in a world gone mad. The existentialists criticise the latter for dividing the world into subject and object. The unity of subject and object, according to them, is existence. In order to be aware of existence, it is necessary to find oneself in a critical border-line situation, for example, confronted with death. As a result, the world becomes "intimately near" to man. Thus, existence is to be known, not through reason, but through intuition.

A central place in existentialism is occupied by the question of freedom of choice. Freedom is seen as the "free choice" of the individual of one possibility among an infinite number of possibilities. Thus we arrive at an entirely abstract conception of "freedom," conceived of as the polar opposite of necessity.

This boils down to an assertion of voluntarism, that the individual is free to make a choice, irrespective of objective circumstances. This, in turn, implies the "freedom" of the isolated individual from society. It is the "freedom" of a Robinson Crusoe, that is, no freedom at all. In effect, they turn the question of freedom into an abstract ethical problem. Yet, in practice, freedom is a very concrete question. It is not possible for real men and women to become free by ignoring the constraints that hold them in bondage, any more than they can jump off a cliff and ignore the laws of gravity.

With existentialism, we reach the complete dissolution of modern philosophy. Jean-Paul Sartre made an unsuccessful attempt to unite existentialism with Marxism, with predictable results. One cannot unite oil and water. Sartre’s thought cannot be described as a coherent body of philosophical ideas. It is a disorderly mishmash of notions borrowed from different philosophers, particularly Descartes and Hegel. The end result is total incoherence, shot through with a pervading spirit of pessimism and nihilism.

For Sartre, the fundamental philosophical experience is nausea, a feeling of disgust at the absurd and incomprehensible nature of being. Everything is resolved into nothingness. This is a caricature of Hegel, who certainly did not think that the world was incomprehensible. In Sartre’s writings, Hegelian jargon is used in a way that makes even Hegel’s most obscure passages seem models of clarity.

Underlying all this is the feeling of impotence of the isolated intellectual, faced with a hostile and uncomprehending world. The attempt to escape from the wicked world into individualism is summed up in Sartre’s celebrated (or notorious) phrase: "L’enfer, c’est les Autres." ("Hell is other people"). How this outlook could ever be squared with the revolutionary optimism of dialectical materialism it is hard to imagine. But then, no-one could ever accuse Sartre of consistency. It is, of course, to his credit that he espoused progressive causes, like Vietnam and solidarised with the movement of the French workers and students in 1968. But from a philosophical and psychological point of view, the position of Sartre was completely foreign to Marxism.

Indian and Islamic philosophy

1) India.

Indian philosophy is traditionally divided into four periods: 1) the Vedic period; 2) the classical (or Brahmin-Buddhist) period, lasting from the 6th century B.C. to the 10th century A.D. approximately; 3) the post-classical or Hinduistic period, from the 10th to the 18th centuries; and 4) the modern period, from the British conquest to the present day.

Oriental philosophy was always closely bound up with religion, starting with Hinduism itself. Hinduism is a system of religious ideas and concepts which has persisted in most of the Indian Subcontinent from the early Middle Ages till the present day, although it includes elements that come from a very remote past. Thus Shivaism has pre-Vedic roots and is related to the idea of Shiva, the lord of fettered animals. In its modern form, however, it arose from the general social and ideological crisis in India in the 6th-4th centuries B.C. In the Hinduistic period, the Vishnu and Shiva systems were developed. It was stated that the Brahman of the Upanishads is the god Shiva, Siva or Vishnu. In his great *History of Philosophy*, Hegel writes: "Indian culture is developed to a high degree, and it is imposing, but its philosophy is identical with its Religion, and the objects to which attention is devoted in Philosophy are the same as those which we find brought forward in Religion. Hence the holy books or Vedas also form the general groundwork for Philosophy." (G.W.F. Hegel, *Lectures on the History of Philosophy*, vol. 1, p. 126.)

In Hinduism, certain dialectical elements can be found in embryo, such as the idea of the three phases of creation (Brahma), maintenance of order (Vishnu) and destruction or disorder (Shiva). Ian Stewart, who has written on Chaos Theory, points out that the difference between the gods Shiva, "the Untamed", and Vishnu is not the antagonism between good and evil, but that the real principles of harmony and discord together underline the whole of existence. "In the same way," he writes, "mathematicians are beginning to view order and chaos as two distinct manifestations of an underlying determinism. And neither exists in isolation. The typical system can exist in a variety of states, some ordered, some chaotic. Instead of two opposed polarities, there is a continuous spectrum. As harmony and discord combine in musical beauty, so order and chaos combine in mathematical beauty." (Ian Stewart, *Does God Play Dice?* p. 22.)

Hegel was not entirely fair to Indian philosophy, since he ignored the non-Vedic materialist strain in Indian philosophy, with his customary prejudice towards materialism in general. However, it is true that the genesis of Indian philosophy is to be found in the oldest of the Indian writings, the Vedas.

Under the impact of Islam, several other monotheistic religions arose in the 10th century, notably Sikhism as an attempt to reconcile Hinduism with Islam. Hinduism is characterised by an extreme proliferation -almost an over-production- of gods. At one time, the number of gods and goddesses in India (330 million) outstripped the current total population. But from the earliest times we also find the opposite tendency: a tendency in the direction of materialism and atheism.

Indian philosophy arose on the basis of one of the oldest of human civilisations, a line of cultural development which far pre-dates the culture of Western Europe. The Indian cultural traditions has its roots as far back as the 10th-15th centuries B.C. and extends in a virtually unbroken thread down to the present day, showing considerable vitality and exuberance. The original source for all Indian philosophy is the ancient body of oral literature known as the Vedas, the most famous of which is the Rig-Veda. These contain, in addition to hymns to nature-gods and details of rituals, other material of a clearly philosophical character. As early as 1500 B.C. the Rig-Veda asks the question: Where does the universe come from? Likewise, the opening verse of one of the Upanishads asks: "Propelled by what does a directed mind fall upon its object? By whom was life first set in motion? Urged by whom are *these* words being spoken? Which god harnesses the eyes and ears?"

The Vedas

The very earliest Indian religious writings, the Vedas, date from about 1500 B.C. and therefore may be considered as the oldest philosophical literature in the world. In a formal sense, the Vedas are hymns to the gods, but, as Hegel also points out Oriental religions are more philosophical in character than Western Christianity. The gods have less of a personal character and are more akin to general concepts and symbols. We even find the elements of dialectics in Hinduism, and above all in Buddhism, as Engels has explained. The gods and goddesses of the Vedas are not persons but manifestations of ultimate truth and reality, and these writings contain a wealth of philosophical and religious speculation about the nature of the universe. The Vedas already contain the germ of a philosophical idea -namely, the concept of a single world order (Ritam). The principle of order, right and justice is thus built into the fabric of the universe itself. There is also a unity of opposites (the particular and the universal) in the unity of Brahman, the world-soul, and Atman, the individual soul; the immortality of the soul which is re-incarnated in accordance with karma or the law of retribution. By doing what is right a man can escape from the eternal treadmill of reincarnation.

The Upanishads, which are ancient commentaries on the Vedas, constitute a further body of Indian philosophical literature, investing the Vedic gods and rites with new philosophical content. The earliest of these texts date from between 10th and 6th centuries B.C. They have had a tremendous effect not only on Indian thinking but also for social life for thousands of years. The Indian caste system, with its elaborate system of rules governing what members of each caste may or may not do, is presented by the Upanishads as an immutable product of the order of the universe. In this scheme of things, Brahma is the creative principle that underlies everything. From this universal principle, everything is born, and returns to after death. Belief in reincarnation is reaffirmed and provides the basis for man's moral conduct. The notion of retribution (*karma*) maintained, for example, that a slanderer would be re-born with bad breath! In order to escape from this cycle, man must devote himself to contemplation of the unity of the soul (*atman*) with *brahma*.

The mystical and idealist nature of this does not require any comment. However, a reading of the Upanishads shows that they contain a series of arguments intended as a rebuttal of materialist and atheist ideas, which were present from the very dawn of Indian

philosophy. In his book *Man, God and Religion*, the modern Indian materialist Geetesh Sharma (himself a former Hindu priest) gives several examples of this:

"In some of the 'suktas' of the Vedas, there is evidence of opposition to the 'Yagnas' [fire worship] and rituals conducted by the priests.

"In the age of the Upanishads, this criticism of the priests becomes all the more sharp. In chhandogya Upanishad, the procession of the priests has been compared to a procession of dogs. In Mundak Upanishad the ritual of human sacrifice and other rites have been severely criticised.

"In the 18 dominant Upanishads there is one Shvasan Veda Upanishad. This Upanishad basically consists of materialist and naturalist teachings. In one section, it is written: 'neither is there any avatar, nor is there any God; neither a heaven nor a hell. All this traditional religious literature is a conception of self-conceited fools'. " (G. Sharma, *Man, God and Religion*, p. 37.)

The Carvakas

There were always those who denied the authority of the Vedas and the life of the soul after death. The earliest Indian materialists, like their Greek counterparts, regarded the elements (water, fire, air) or else time or space, as the primary substance of the universe. The earliest information of this materialist doctrine is to be found in the Vedas and in the Sanskrit epics. The name, Lokayata, means "the view held by the common people", "the system which has its base in the common, profane world", "the art of sophistry", and also "the philosophy that denies that there is any world other than this one". Tradition attributes the Lokayata doctrine to a sage called Brihaspati, who, along with another figure called Charvaka (or Charvak), were the most outstanding proponents of the materialist doctrine. Since nothing is known about them, many have thought them to be mythical personages. But then, very little is known about the early Greek philosophers either, yet we usually accept them as historical figures.

Carvaka rejected the notion of an afterworld, the authority of the sacred scriptures, the Vedas, and the immortality of the self. All such non-material objects as "afterlife", "destiny", or "soul" do not exist. Consciousness thus is viewed as a product of the material structure of the body and characterises the body itself -rather than a soul- and perishes with the body. The Lokayata doctrine conceived of the universe as being formed of the four elements: earth, water, air and fire. In some texts, a fifth element (the ether) is added. These elements, in turn, were said to be composed of atoms, indivisible units which were conceived as immutable, indestructible and having existed for all time. The properties of any given object were determined by the atoms that comprised it. Likewise, consciousness and the senses were the result of a particular combination of atoms and the proportions in which they were combined. After the death of an organism, this combination disintegrated into elements that then combined with corresponding types of atoms in inanimate nature.

This early Indian materialism, for its incompleteness and naïve elements, contains the germs of a profound idea and represents a brilliant anticipation of modern atomic science,

in the same way as the philosophy of Democritus, Leukippus and Epicurus in ancient Greece. Moreover, in some ways it anticipated the modern theory of evolution. Some of the texts describe how certain elements originate from others, with the earth as the primordial source of all development. In the field of epistemology (the theory of knowledge) the doctrine of Lokayata is sensory, that is to say, it states that all human knowledge is derived from the senses (sense-perception). The sense-organs can only apprehend objects because they themselves are composed of the same elements. Like is known to like. Therefore it denied the possibility of any indirect knowledge. Inference and conclusion were regarded as false instruments of cognition. Of the recognised means of knowledge (pramana), the Carvaka recognised only direct perception (anubhava). "Seeing is the source of all evidence," Brihaspati is supposed to have said.

This shows the negative side of early Indian materialism, which tended towards a narrow sensualism. But this is a defect which it shares with all materialism before Marx. The same narrowness can be seen in, say, the English empirical materialism of Bacon, Locke and Hobbes who nevertheless represented a giant step forward in relation to the idealism and religious obscurantism of the Middle Ages and laid the base for the whole development of modern science. What is astonishing about this early materialism is not its limitations but its extraordinary insight and profundity.

In striking contrast to the mysticism and asceticism of the prevailing religion, the Indian materialists denied the existence of god, the soul and the idea of retribution ("Karma"). This school was alone in the whole gamut of Indian thought that rejected the transmigration of souls. instead, the predominant feature of Lokayata was a healthy and cheerful hedonism. Against the perspective of a never-ending cycle of life and death with the prospect of an eventual spiritual liberation, Carvaka ethics urged each individual to seek his or her pleasure here and now. "As long as you live, live life to the fullest," said Charvaka. "After death, the body is turned to ashes. There is no re-birth." These words, so full of love for humanity and life, are strikingly reminiscent of the life-enhancing philosophy of Epicurus.

With great courage, and also with a lively sense of humour, the Carvaka materialists mocked religious ceremonies, saying that they were invented by the Brahmans (the priestly caste) to ensure their livelihood. When the Brahmans defended animal sacrifices by claiming that the sacrificed beast goes straight to heaven, the members of the Carvaka asked why the Brahmans did not kill their aged parents to speed them on their way to heaven!

Of other early Indian materialists, Geetesh Sharma writes: "Kapil's 'sankhya-philosophy' is basically atheistic. Buddha and Mahavir did not believe in the concept of God yet Mahavir was more spiritualist. Buddha conceived of a religion that had the absence of a Godly concept and was rather based on humanistic principles, logically formulated, illustrating the basic human values of life. He wanted to bring about the emancipation of suffering humanity and therefore based the fundamental principles of his religion on those values, while still being an atheist.

"Madhavacharya, in his works, has elaborated on the theory of materialist philosophers who believed only in the present existing world. They did not believe in the theory of

divine creation of the universe by a supernatural power. According to them, if there is a benevolent God supervising humanity, then why is it that a majority of the human population is in the throes of misery and suffering? If there is a just God above us, then why is there so much injustice on the earth, against the poor and deprived sections of society?

"Saint Brihaspati, pioneer of materialism, during the age of the Rig Veda, believed that fire worship, ritualism, practising the Vedas, smearing ashes all over the body, etc., were antics performed by those who considered themselves powerful and learned (...) Dhishan, the disciple of Brihaspati, considers the composers of the Vedic texts a group of confidence-tricksters. The Vedic thinker Permeshthin considered matter as the complete truth. According to him, it is the only source of ideal knowledge." (G. Sharma, *Man, God and Religion*, pp. 36-7.)

Unfortunately, little is known about the details of this philosophy. Owing to the fierce opposition of the Vedic establishment, not a single document has come down to us, and we are obliged to learn about the ideas of these heroes from the writings of their enemies, particularly the philosophical treatises and compendia (darsana) written by the Vedic opponents of Lokayata between the 9th and 16th centuries. Ultimately, the supporters of materialism were fighting a lost battle. The triumph of the Vedas and Upanishads was consolidated in the classical period. But even then there was always a strand of unorthodox thinking that challenged the Vedic authority upheld by the orthodox Mimamsa, Samkhya, Yoga, Nyaya, Vaiseshika and Vedanta schools. Apart from the consistently atheist and materialist schools of Charkvakas and Lokayata, there were also non-orthodox movements such as the Buddhist and Jainist schools.

All anti-Vedic schools, and even some Vedic schools such as Samkhya and Mimamsa, were atheistic. The existence of god was a standard topic for rational debate. In the 11th century Udayana, in his *Flower Offerings of Arguments*, set forth five ways of proving the existence of god. The atheists put forward excellent rejoinders, like the following: "If the universe requires a maker because it undergoes change, even God needs a maker because he sometimes creates, sometimes destroys."

Buddhism and dialectics

The period of the 6th century B.C. in India was a turbulent one. The primitive communal system was collapsing and being replaced by class society, the cleavage of society into rich and poor and the rise of an oppressive state. Such periods in human history are inevitably characterised by a crisis of ideology, and the birth of new schools of philosophy, politics and religion. Siddhartha Gotama, known to his followers as the Buddha (the Enlightened One) was the founder of just such a radical school of thought that developed as a reaction to the ossified form of the old Vedic philosophy

Born about 563 B.C., the son of a nobleman, Siddhartha is typical of the type of person who breaks away from the upper class and begins to reflect the protests and aspirations of the common people in a revolutionary period. Until he was 29 years old, he lived the sheltered life of a typical prince, with every luxury he could desire. According to legend, he saw a vision (the "Four Signs") which jolted him out of his complacency. He saw in

rapid succession a very feeble old man, a hideous leper, a funeral, and a venerable ascetic monk. He began to think about old age, disease, and death, and decided to follow the way of the monk. For six years he led an ascetic life of renunciation, but finally, while meditating under a tree, he concluded that the solution was not withdrawal from the world, but rather a practical life of compassion for suffering humanity.

Buddhism is often thought to be a religion, and indeed over the centuries it has adopted the outward appearance of a religion. This is ironic, because the Buddha himself was opposed to religion. He rejected the authority of the Vedas and refused to set up any alternative creed. The old Brahman religion, with its rigid division of society into castes, its complicated rites and sacrifices to the gods, was becoming widely discredited. By contrast, Siddhartha's doctrine was direct and simple and eagerly accepted by the masses. He considered religious ceremonies as a waste of time and theological beliefs as mere superstition. In place of religious beliefs and religious ceremonies, the Buddha advocated a life devoted to universal compassion and brotherhood.

He taught that it was possible to gain liberation from suffering, not by changing society or fighting to dominate nature, but by withdrawing from life, seeking to gain moral perfection and submerging oneself in nirvana. Through such a life one might reach the ultimate goal, Nirvana, a state in which all living things are free from pain and sorrow. It is generally supposed that because Nirvana can be reached by meditation, Buddhism teaches a withdrawal from the real world. But this is debatable. A Buddhist might reply that the goal of Nirvana is not to be sought for oneself alone. It is regarded as a unity of the individual self with the universal self in which all things take part. Through living a life of compassion and love for all, a person achieves the liberation from selfish cravings sought by the ascetic and a serenity and satisfaction that are more fulfilling than anything obtained by indulgence in pleasure until everything that exists in the universe has attained Nirvana.

However, leaving aside the accusation that Buddhism involves a passive element, whereby men and women learn to accept their lot instead of struggling actively to change it, Buddhism, in its origins, undoubtedly contained an important critical and revolutionary element. Buddha denied the existence of god as the creator of the world. He rejected the teachings of the Vedas. He accepted the old idea of the cycle of births and deaths (sansara) and retribution (karma), but here it has a different sense. It meant that reincarnation depended, not on a man's caste, or on what rituals and sacrifices he performed, but only on his good or bad actions. In the realm of ethics, Buddhism advocated a morality based on selflessness and compassion for suffering humanity. The Buddha told his followers to think for themselves and take responsibility for their own future. The revolutionary implications of this idea, and its appeal to the masses at this time, is self-evident.

The new doctrine was argued in a highly consistent and logical way in the 2nd century A.D. by Nagarjuna, whose rationalism became the basis for the development of Buddhist logic. In common with the great idealist thinkers of the West, Nagarjuna, in defence of a false idealist theory (here carried to the extreme of a denial of the reality of the world) nevertheless pushed the development of logic and dialectics forward. The logic of Buddhism was later developed by other notable thinkers such as Dignaga and

Dharmakirti (500-700 A.D.). This laid the basis for later idealist schools such as Madhyamaka, Vijnanavada, Tantric Buddhism and Zen Buddhism.

However, the character of the new movement gradually changed. In the first period (the 3rd century to the 1st century B.C.) the Buddha's idea of salvation was based on the idea that the world and human personality constitute a stream of elements of matter and consciousness (the dharmas) which constantly replaced each other. The road to salvation lay in not disturbing the dharmas. But in the early centuries A.D. Buddhism was transformed. Before this Buddha was only a revered teacher. Now he became deified, and salvation had to be sought through the favour of the deity, by the constant repetition of the sacred sutras (scriptures). In this way, Buddhism was turned into its opposite. This new version of Buddhism (Mahayana) was radically different from the original version (Hinayana) taught by the Buddha himself. The latter taught that the material and psychical dharmas were real, whereas the doctrine of Mahayana maintains, not only the dharmas, but the whole world, is unreal.

Throughout the history of Indian philosophy there was always a struggle between materialism and idealism. Both Buddhist and Brahman writers denounced materialist philosophies like that of Samakara, the most outstanding Vedanta philosopher. They waged a fierce struggle against the materialist ideas of this school and also the empiricism of the Nyaya and Vaiseshika schools. Even within Buddhism itself there was a struggle between trends that leaned towards materialism or idealism, such as the struggle between the idealist Madhyamika and yogacara schools against the materialist doctrine of the Theravidins and the Sarvastivadins. Through such bitter internal strife and debate, philosophy develops and grows, creating the necessary tools in the form of logic, which experienced a certain development at the hands of such Buddhist philosophers as Dignaga and Dharmakirti.

However, towards the end of the classical period, Hinduism was fighting back. Janaism, that other great opposition trend in the religious world of the Indian Subcontinent, with its strict insistence on non-violence and respect for all life, was losing ground. And finally Buddhism itself, despite all its brilliant successes, was virtually ousted from India. The Buddha lived and taught in India, and so Buddhism is generally considered an Indian ethical philosophy. Yet, Buddhism did not sink deep roots in the land of its origin. Instead, it spread in different forms south into Sri Lanka and South-east Asia, and north through Tibet to China, Korea, and Japan. In the process, Buddhism suffered the same fate as the Vedic philosophy against which it had rebelled: it became a religion, often rigid, with its own sects, ceremonies, and superstitions -an ironic fate, if one considers the original views of its founder.

The dynamic element in Buddhism, its dialectical side, is shown by its view of reality as something eternally changing and impermanent. By contrast, for the Vedanta philosophy, only the changeless and eternal is real. Modern Buddhist thinkers tend to lay more stress on its "rationalistic" and "atheistic" character with the aim of making it more acceptable to educated westerners in search of a satisfying alternative to Christianity that is dying on its feet. But although it is true that Buddhism in its original form possesses a rational core, and that some of the elements of dialectics were present in it, they were present only in an extremely primitive and undeveloped form, as in Heraclitus and the early Greek

philosophers. This represented the first faltering steps of dialectical philosophy, like the first steps of a child that is learning to walk. It is true that childhood has a charm all of its own, and all of us at times dream of returning to it. But to propose to go back to an earlier, undeveloped and embryonic form, when we possess the fully developed, wide-ranging and profound philosophy of dialectical materialism, is like proposing to a grown man or woman that they should revert to childhood. The real development of dialectics can be found only in the revolutionary philosophy of Marxism.

Decay of Indian philosophy

The advent of colonialism had the effect of throwing back the development of Indian philosophy. On the whole, the progress of philosophy in the 18th and 19th centuries was not noteworthy, and lagged behind the development of social and political awareness, linked to the national awakening and the commencement of the struggle for national liberation. The dominant influence in the newly founded universities was, naturally, the empiricist, utilitarian, and agnostic philosophies imported from England, along with other shoddy products of Victorian Britain. The Indian intellectual was fed on the thin gruel of John Stuart Mill, Jeremy Bentham, and Herbert Spencer in order to addle their brains and ensure they did not read more subversive material. There were reactions against, usually of a conservative-mystical character like the Brahmo (Brahma) Samaj movement founded by Rammohan Ray and, toward the later decades of the century, the great saint Ramakrishna Paramahamsa of Calcutta. This reflected mere impotence in the face of Western domination, nothing more. Others played with Kant and Hegel, but without any substantial result. Gandhi and Rabindranath Tagore made noises that sometimes sounded vaguely philosophical, but the degenerate Indian bourgeoisie was no more capable of producing independent thought than it was of leading a fight for genuine independence from British imperialism.

At the present day, more than fifty years after the declaration of Independence, India and Pakistan are more enslaved to imperialism than in the days of the Raj. The domination of imperialism is not nowadays realised through direct military-bureaucratic rule, but through the mechanism of the world market and the terms of trade, whereby more labour is exchanged for less. The enslavement is none the less for that. Fifty years later, the Indian and Pakistan bourgeoisies stand condemned before history. They have not realised a single one of the tasks of the bourgeois-democratic revolution. They have not solved the agrarian problem. They have not modernised society. They have not solved the national problem. The Indian bourgeoisie has not even been capable of abolishing that atrocious relic of barbarism, the caste system. Above all, they have not got real independence at all.

And now society must pay the price for the rottenness and incapacity of the bourgeoisie. What an irony! Gandhi, Nehru, and the other leaders of Congress regarded themselves as secular, even socialists. Now, fifty years later, the monstrous head of Hindu chauvinism and communalism is being raised in India. This is the revenge of history, its final verdict on decades of rule by Congress. And a similar situation exists in Pakistan, where the dark forces of Islamic fundamentalism are threatening to tear apart the fabric of society. These reactionaries, in claiming the unique right to "defend" their own religion and culture, in fact do irreparable damage to both. Yet a study of the history of Islam shows that its

greatest achievements were attained in periods of religious tolerance and freedom, whereas the so-called fundamentalists have caused nothing but harm to the Islamic world.

2) Philosophy of the Islamic world

The religion of Islam arose in the 7th century in Arabia, in the period of the transition of the Arab people from the primitive communal system to class society. It signified the unification of the Arabs in a common state (the Caliphate). The advent of Islam radically transformed the lives of millions of people. With its simple, levelling message, and its opposition to the reactionary caste system (though not classes) it struck a responsive note especially among the poorest and most downtrodden layers of the population. In its origins, Islam represented a revolutionary movement and the awakening of the great Arab nation. One of Mohammed's last speeches ends with the following words: "Ye people! hearken to my speech and comprehend the same. Know that every Moslem is the brother of every other Moslem. All of you are of the same equality." (Quoted in A.C. Bouquet, *Comparative Religion*, p. 270.)

Like all revolutionary movements in history, it also revealed itself as a spiritual and intellectual awakening. Despite frequent attempts by later so-called fundamentalists to interpret Islam in a narrow and fanatical spirit that denies independent thought and cultural inquiry, in its early period, the Islamic revolution gave a powerful impulse to culture, art and philosophy. In his classic *Short History of the Saracens*, Ameer Ali Syed has this to say about Ali, the nephew of the Prophet and head of the first Arab Republic: "While Islam was ... extending its sway in distant parts, Ali was endeavouring in Medina to give an turn to the new-developed energy of the Saracen race. In the public mosque at Medina, Ali and his cousin Abdullah the son of Abbais, delivered lectures on philosophy and logic, the traditions (history), rhetoric and law, whilst others dealt with other subjects. Thus was formed the nucleus of that intellectual movement which displayed itself in such great force in later times in Baghdad." (Ameer Ali Syed, *Short History of the Saracens*, p. 47.)

This was already the state of affairs in the 7th century. Contrary to the opinions of the modern fundamentalists, Islam, in its origins, was not equivalent to the worship of ignorance and narrow-minded fanaticism. In complete contrast to what passed for philosophy in the universities of medieval Europe, where it was utterly subservient to the Catholic Church, Islamic philosophy was not a handmaid of theology. The formative period of Islamic philosophy dates from the late 8th century to the mid-9th century. Supported by the Caliphs, notably Ma'mun, it was known for its tolerance and freedom of scientific inquiry. Scholars from nations conquered by the Arabs were welcomed by state-endowed institutions. Free-ranging rationalist debate was encouraged. An important feature was the study of Greek texts in translation. At a time when Europe languished in the dark ages, the flame of culture and civilisation was kept shining brightly in the Islamic countries. Baghdad was the centre of a vast civilisation that extended from Cordoba in Spain to India.

As early as 664 A.D. an Arab force reached as far as Afghanistan and took Kabul. About 717, the conquest of Sind was carried out. From here the Arabs turned south and captured Multan. By 1010 the western part of Punjab was subdued. In 1206 Kutb-ul-Din

proclaimed himself sovereign of the whole of northern India at Delhi. During the next 120 years the invasion moved steadily south. In the 15th century, the Moslem rule in India was split up into a number of petty states. Finally, these were united into a mighty empire under the Moghul emperor Akbar and his successors. A.C. Bouquet writes: "Akbar was tolerant of Hinduism, and tried to establish an eclectic religion, including elements from all the other faiths recognised in his realm." (A.C. Bouquet, *Comparative Religion*, p. 138.)

This was a truly universal civilisation. Islamic thinkers such as Ibn Sina (known in the West by his Latin name Avicenna), who lived in Central Asia, in the important university town of Bokhara, was not only a philosopher but also a physician and natural scientist who, although faithful to Islam, did much to spread the knowledge of the scientific and philosophical knowledge of Greek antiquity throughout the Arab world, and thence to Europe, which, for all its fear of Islam, looked to the Arabs as a source of knowledge and education. There were many other great thinkers, like Al-Farabi (flourished 9th-10th centuries), the author of the first works of political philosophy within the context of the religion of Islam (*The Attainment of Happiness and The Political Regime*). Ibn Sina and others like him helped to consolidate rationalist thinking and propagate natural science and mathematics, both fields in which the Arabs made great discoveries.

Spain and the Arabs

The conquest of Spain which began in 711 A.D. marked a turning-point in world history. The Arabs who made the first incursions from North Africa had only intended to make a plundering raid, but the inner rottenness of the Visigoth kingdom led to its speedy collapse. The Arabs -or Moors as the Spaniards called them- conquered almost the whole Peninsular and advanced deep into France. The speed of the conquest was mainly because the oppressed Spanish masses rallied to the invaders, who certainly treated them better than their fellow Christian landlords.

The conquest of Spain had the character of a social-revolutionary war, which has been compared to the French revolution. The Arabs appeared before the Spanish serfs as social emancipators, not foreign conquerors. They abolished the oppressive rights of the possessing classes -the feudal landlords and clergy-, and replaced the crushing burden of taxes by a single tax which, as well as being relatively light, was not levied on women, children, the sick, the blind, beggars or slaves. Even the Christian monasteries were exempt. Most Spanish cities were granted favourable terms which were honourably kept by the conquerors. The only land that was confiscated was that of the nobles and clergy who had fled to join the enemy (the demand of the confiscation of the property of counterrevolutionary émigrés was later included by Marx and Engels in the *Communist Manifesto*.)

In essence, Islam contains a democratic and levelling idea which asserts the equality of all men, irrespective of race or colour. This was remarkably advanced for the period under consideration. Far from persecuting other faiths, the Arabs in Spain were far more tolerant than the Christians either before or after Arab rule. They protected all religions and immediately allowed the persecuted Jews to worship freely. Let us recall that the Spanish Inquisition later brutally expelled the Jews from Spain. Like the Mogul rulers of

India, they encouraged intermarriage between the conquerors and the conquered in order to bring about the fusion of the two peoples. They advanced agriculture and created the architectural wonders of Granada, Cordoba and Seville. No wonder a large part of the Spanish population became converts to Islam, and demonstrated their loyalty by fighting to defend their homeland and freedoms against the armies of Christian-feudal reaction in the North.

W.C. Atkinson describes the impact of Islamic culture on the minds of the Spaniards in the words of the famous lament of Alvaro of Cordoba: "Alas, all the Christian youths who become famous for their talent know only the language and the literature of the Arabs; they read and study zealously Arabic books, of which by dint of great expenditure they form extensive libraries, and proclaim aloud on all sides that this literature is worthy of admiration." (From W.C. Anderson, *A History of Spain and Portugal*, p. 60.)

The same author outlines the economic advance achieved by the Arabs in Spain: "Irrigation works, of which traces still survive today, made fertile wide areas of irregular or inadequate rainfall; rice, the sugar-cane, and other exotic crops were introduced; and although the Koran forbade the drinking of wine, the vine was cultivated on a large scale.

"Industry enjoyed a parallel prosperity, that ranged through gold and silver mining, the weaving of wool and silk, the manufacture of paper, introduced into Europe by the Arabs, and of glass, invented in Cordoba in the ninth century, metalwork, ceramics, and leatherware. The fame of these products travelled far, and to handle the flourishing commerce that resulted there grew up a great trading fleet based chiefly in Seville, Malaga, and Almeria." (Ibid., p. 58.)

Thus began a period of economic and social advance that lasted for centuries, and with it a brilliant chapter in the history of human culture, art and science. One commentator writes: "The Moors organised that wonderful kingdom of Cordova, which was the marvel of the Middle Ages, and, when all Europe was plunged in barbaric ignorance and strife, alone held the torch of learning and civilisation bright and shining before the Western world." (Quoted in Ameer Ali Syed, *Short History of the Saracens*, p. 115.)

Anyone who today visits the Alhambra in Granada or the Mosque at Cordoba will instantly understand that the Arabs of Spain were far in advance of medieval Europe, which they excelled, not only in science and technology, but also in the fine arts, sculpture and painting. The Arabs' cultural tradition was broad: it included the study of logic, the sciences of nature (including psychology and biology), the mathematical sciences (including music and astronomy), metaphysics, ethics, and politics. No town, however small, was without a school or collage, while every principal town had its own university, including Cordoba (renowned throughout Europe), Seville (Ishbilia), Malaga, Zaragoza, Lisbon (Alishbuna), Jaen and Salamanca, which subsequently became the most prestigious of all Spanish universities. There were a galaxy of writers, poets, historians and philosophers.

Contrary to what one might expect, there were many famous women intellectuals. At a time when the notion of the equality of women would have been anathema in Christian Europe, many distinguished poetesses and cultured ladies were held in esteem in Cordoba

and Granada. Hassana at-Tamimiyeh, daughter of Abu'l Hussain the poet, and Umm ul-Ula, both natives of Guadalajara, flourished in the 6th century of the Hegira. Ammat ul-Aziz (a descendant of the Prophet, and therefore styled ash-Sharifa) and al-Ghusanieh, from the province of Almeria, were both women who were in the front rank of scholars at the time. There were many others. Mariam, daughter of Abu Yakub al-Ansari, was a native of Seville, where she taught rhetoric, poetry and literature, "which, joined to her piety, her good morals, her virtues, and amiable disposition, gained her the affection of her sex and gave her many pupils." (Ameer Ali Syed, op. cit., p. 578.)

Backward Europe and advanced Asia

So far from Islamic thought being limited to mysticism and religious fanaticism, it showed a natural inclination to rationalism and science, in which for centuries the Arabs led the world. Great advances were made especially in mathematics and astronomy, but also in many other spheres of science and technology. This point is made by Alfred Hooper in his history of mathematics:

"We have much for which to thank the Moors. They introduced new ideas about medicine and medical knowledge; they taught improved methods of working in metal and leather; they built waterworks, sluices and canals in Spain; in all, they brought the wisdom of India and the East to a Europe which had sunk back into ignorance and savage ways.

"The Arabs were familiar with the work of the great Greek mathematicians who had built up the 'Golden age of Greek mathematics' before the fragile and wonderful civilisation of Greece was absorbed by the intensely practical and utilitarian Romans; *they also introduced into Spain the new and revolutionary method of writing numbers that they had learned from the Hindus*, a method that was to pave the way for our modern world of science and engineering and mathematics." Alfred Hooper, *Makers of Mathematics*, p. 24.)

Throughout the Middle Ages the only real advances in mathematics were made by the Indians and Arabs. It was they who discovered trigonometry. It was the Arabs who discovered algebra. The very word is Arabic -*al-jabr*- which, like so many other things, found its way into Europe from Spain. The Arab mathematician al-Khowarizmi, as well as writing a book on Hindu-Arab number systems (the Indians also played a vital role in developing mathematics, and the Arabs learned from them), wrote another book on the treatment of equations which he called *al jabr w'al muquabalah*, "the reunion and the opposition". This was later translated into Latin and hence became accessible to Europeans.

Alfred Hooper comments: "The years from about 800 to about 1450, known as the Middle Ages, were marked by an almost complete stagnation of independent thought, which paralysed mathematical progress and cast its gloom over European mathematicians as over all other thinkers." (A. Hooper, op. cit., p. 84.)

The same author adds: "Centuries after the Arabs had introduced the new number-symbols into Europe many people still clung to the old familiar Roman numerals and

would have nothing to do with the new system, which they associated with traders and heathens. By the 13th century, however, the new system of writing numbers had become established in many parts of Europe. *It was not until then that any real development in the number-reckoning we now call elementary arithmetic could take place*." (Ibid., p. 26, my emphasis.)

The Medieval world gained access to the ideas of Aristotle and Plato mainly from Arab sources. Out of a host of brilliant thinkers who influenced medieval Europe, a special mention must be made of Ibn Roshd Muhammed -known in the West by his Latin name Averroës. This great Arab philosopher lived between 1126 and 1198 in Spain during the Caliphate of Cordoba. In his writings, we see the elements of a materialist philosophy, derived from a careful reading of Aristotle. Although he remained a devout Moslem, Ibn Roshd attempted to prove that matter and motion could neither be created nor destroyed, thus anticipating the conservation theories of modern physics. He likewise denied the immortality of the soul. So radical were these ideas, that his theories were persecuted by orthodox Moslems. But through the work of this great philosopher, particularly his commentaries on Aristotle, Europeans became acquainted with the long-forgotten world of classical Greek philosophy.

The main fountainhead of this knowledge was Islamic Spain, which, until it was destroyed by the Christians, was a flourishing, prosperous and cultured nation. Granada, Seville and Cordoba were important and internationally renowned centres of learning. All religions were treated with enlightened tolerance, until the Spaniards led by those narrow-minded and fanatical bigots Fernando of Castille and Isabelle of Aragon set about reducing the flower of Al-Andalus to a heap of bloody ashes. It is ironic that, to this day, Europeans still see themselves as the exclusive bearers of human culture when for the whole of the Middle Ages they acted as the grave-diggers of culture in the East.

The so-called Crusades about which so much romantic rubbish has been written were just so many destructive and bloodthirsty raids of barbarians against people who were, in every respect, their superiors. One of the Christian chroniclers of the siege of Granada, Father Agapito, writes in contemptuous terms about the Arab habit of washing themselves: "Water is more necessary to these infidels than bread; as they make use of it in repeated daily ablutions, and employ it in baths, and in a thousand other idle and extravagant modes, of which we Spaniards and Christians make but little account." (See W. Irving, *The Conquest of Granada*, p. 251.)

The reactionary and barbarous nature of the Crusades has been sufficiently demonstrated by modern historians like Stephen Runciman. Here is a typical extract by another writer: "In each captured city the Tafurs [poor crusaders] looted everything they could lay their hands on, raped the Moslem women and carried out indiscriminate massacres. The official leaders of the Crusade had no authority over them at all. When the Emir of Antioch protested about the cannibalism of the Tafurs, the princes could only admit apologetically: 'All of us together cannot tame King Tafur'." (N. Cohen, *In Search of the Millennium*, pp. 66-7.)

And again: "The fall of Jerusalem was followed by a great massacre; except for the governor and his bodyguard, every Moslem -man, woman and child- was killed. In and

around the Temple of Solomon 'the horses waded in blood up to their knees, nay up to the bridle. It was a just and wonderful judgement of God that the same place should receive the blood of those whose blasphemies it had so long carried up to God.' As for the Jews of Jerusalem, they took refuge in their chief synagogue and they were all burnt alive. Weeping with joy and singing songs of praise the crusaders marched in procession to the church of the Holy Sepulchre. 'Oh new day, new day and exultation, new and everlasting gladness... That day, famed through all centuries to come, turned all our sufferings and hardships into joy and exultation; that day, the confirmation of Christianity, the annihilation of paganism, the renewal of our faith!'" (Ibid., p. 68.)

Reactionary trends in Islam

The development of Islamic culture, however, did not proceed in a straight line, any more than any other. From the beginning there were conflicting tendencies. There was a reactionary strand. Islam, after all, was born as a religion of conquest. The notion of hostility to infidels (gyawurs), the inferiority of women, and the justification of social inequality, were also present -although at that time, no more than among the Christians. Like all religions, Islam is open to a narrow and fanatical interpretation (fundamentalism). At times, there were periods of reaction, which curtailed the advance of rationalist thought and scientific discovery. The destruction of the great Abbasid Caliphate by the Mongols in the 13th century set the whole process back and prepared the way for one of the periodic outbursts of Islamic fundamentalism. Ibn Taymiyya called for believers to rid Islam of all innovations. This is the expression, not of the advance of Islam, but of internal crisis, division and decline. This fundamentalist reaction was a disaster for the development of thought and culture in the Arab world. For a time, the flame passed to Iran.

In the 16th century, the Shi'ite scholars were identified with a philosophy of enlightenment which even found a political expression. As a result new scientific and philosophical advances were made possible. The great period of revival came in the 16th and 17th centuries in Iran under the Safavid dynasty, which established the Shiite brand of Islam as the official state religion, primarily as a defence against the Sunni Ottoman empire. The Safavids provided artists and intellectuals with well-endowed institutions and a liberal atmosphere in which to carry on their work. As in every other period where Islamic scholars have been allowed freedom to live and breathe, brilliant results were achieved by thinkers such as Mir Damad and his pupil Molla Sadra and other luminaries of the school of Isfahan.

All this is sufficient to disprove the Western prejudice that the East in general, and the Islamic world in particular, has produced nothing of note in the field of philosophy. In those periods where Islamic scholars were permitted the freedom to develop, they have proved more than equal to the best that the West has produced. But where Islam has been interpreted in a narrow and fanatical spirit, great harm has been done. The intellectual, resenting the onerous restrictions placed upon him, has reacted against the authority of a religion that appears to be the negation of culture and freedom. Thus, there is an anti-religious strain in Islamic poetry. As the following examples show. In the 17th century Dara Shikoh wrote: "Heaven is where the Muslim priests do not reside and the people do not follow his edicts. In the city where the Muslim priests reside, wise men are never to

be found." (Dara Shikoh, 1615-1659.)

Almost a century later the Sufi poet Sachai Sarmast complained bitterly: "It is religion itself which has misled the people of the nation as well as the Sheikhs and peers (the priests) who have gruesomely misled the people. While one is a supplicant in the mosque, the other kneels before a temple. But neither of them is any closer to love of humanity." (Sachal Sarmast, 1731-1829.)

Today the rise of fundamentalism has once again cast a dark shadow over the development of Islamic culture. The victory of the Taliban in Afghanistan, supported by the guns and money of Christian America, represents the ultimate triumph of barbarism and the blackest obscurantism that conceals its nakedness behind a religious fig-leaf. Today it is hard to gaze upon the smouldering heap of rubble that once was Kabul and remember that this was once one of the great centres of the culture of Islam in Central Asia. For any person with the slightest knowledge of the history of this culture, the descent into barbarism is all the more painful.

Of one thing we can be sure. Only socialism can provide the antidote to this disease. The peoples of the East, who gave the world such glorious proof of their intellectual and artistic vitality, will not forever be content to slumber in chains of material misery and cultural poverty. And when the day finally dawns when they put an end to capitalist slavery and transform society on socialist lines, they will take a giant broom in their hands, and they will sweep society clean of all the accumulated rubbish of ignorance, obscurantism and communal savagery. The socialist reconstruction of society must be carried out from top to bottom. And when this great work is finally accomplished, they will create such wonders of creation that they will put in the shade all the marvels of Granada and Cordoba. Then the peoples will rediscover their true heritage and tradition, and recover all their lost dignity and pride in themselves. The old will be created anew and placed on an infinitely higher level for the enjoyment and fulfilment of future generations.