OXFORD

THE EASTER COMPUTUS AND THE ORIGINS OF THE CHRISTIAN ERA

Alden A. Mosshammer

OXFORD EARLY CHRISTIAN STUDIES

OXFORD EARLY CHRISTIAN STUDIES

General Editors

Gillian Clark   Andrew Louth

THE OXFORD EARLY CHRISTIAN STUDIES series includes scholarly volumes on the thought and history of the early Christian centuries. Covering a wide range of Greek, Latin, and Oriental sources, the books are of interest to theologians, ancient historians, and specialists in the classical and Jewish worlds.

Titles in the series include:

Clement of Alexandria and the Beginnings of Christian Apophaticism
Henny Fiskå Hägg (2006)

The Christology of Theodoret of Cyrus
Antiochene Christology from the Council of Ephesus (431) to the Council of Chalcedon (451)
Paul B. Clayton, Jr. (2006)

Ethnicity and Argument in Eusebius' *Praeparatio Evangelica*
Aaron P. Johnson (2006)

Union and Distinction in the Thought of St Maximus the Confessor
Melchisedec Törönen (2007)

Contextualizing Cassian
Aristocrats, Asceticism, and Reformation in Fifth-Century Gaul
Richard J. Goodrich (2007)

Ambrosiaster's Political Theology
Sophie Lunn-Rockliffe (2007)

Coptic Christology in Practice
Incarnation and Divine Participation in Late Antique and Medieval Egypt
Stephen Davis (2008)

Possidius of Calama
A Study of the North African Episcopate in the Age of Augustine
Erica T. Hermanowicz (2008)

Justinian and the Making of the Syrian Orthodox Church
Volker L. Menze (2008)

The Christocentric Cosmology of St Maximus the Confessor
Torstein Theodor Tollefsen (2008)

Augustine's Text of John
Patristic Citations and Latin Gospel Manuscripts
H. A. G. Houghton (2008)

Hilary of Poitiers on the Trinity
From *De Fide* to *De Trinitate*
Carl L. Beckwith (2008)

The Easter Computus and the Origins of the Christian Era

ALDEN A. MOSSHAMMER

OXFORD
UNIVERSITY PRESS

OXFORD
UNIVERSITY PRESS

Great Clarendon Street, Oxford OX2 6DP

Oxford University Press is a department of the University of Oxford.
It furthers the University's objective of excellence in research, scholarship,
and education by publishing worldwide in

Oxford New York

Auckland Cape Town Dares Salaam Hong Kong Karachi
Kuala Lumpur Madrid Melbourne Mexico City Nairobi
New Delhi Shanghai Taipei Toronto

With offices in

Argentina Austria Brazil Chile Czech Republic France Greece
Guatemala Hungary Italy Japan Poland Portugal Singapore
South Korea Switzerland Thailand Turkey Ukraine Vietnam

Published in the United States
by Oxford University Press Inc., New York

First published 2008

British Library Cataloguing in Publication Data
Data available

Library of Congress Cataloging in Publication Data

Mosshammer, Alden A.
The Easter computus and the orgins of the Christian era/Alden A. Mosshammer.
p. cm.–(The Oxford early Christian studies series)
Includes bibliographical references and index.
ISBN 978–0–19–954312–0
1. Easter. 2. Church calender–History. 3. Church history–Chronology. 4. Dionysius Exiguus,
d. ca. 540. I. Title.
CE83.M65 2008
263′.9—dc22 2008021637

Typeset by SPI Publisher Services, Pondicherry, India
Printed in Great Britain
on acid-free paper by
CPI Antony Rowe, Chippenham, Wiltshire

ISBN 978–0–19–954312–0

1 3 5 7 9 10 8 6 4 2

Acknowledgements

The University of California, San Diego, granted two separate periods of sabbatical leave between 2001 and 2003 for work on this project. During that period and again after my retirement from UCSD in the fall of 2002, the Department of Classics and the Associate Dean for Humanities at Dartmouth College extended to me the privileges of a Visiting Scholar. The excellent collections of the Baker-Berry Library at Dartmouth greatly facilitated my work.

After I relocated to Prescott, Arizona, in the fall of 2004, I found myself several hundred miles from the nearest major research library. The Interlibrary Loan Department at the Prescott Public Library obtained a number of volumes for me. The Interlibrary Loan Department at the University of California, San Diego, has also been extremely helpful in providing electronic copies of articles and chapters and sometimes sending me whole volumes by overnight parcel delivery. I especially want to thank Shannon Carreras for prompt and gracious response to my many requests.

Several individuals responded to my requests by email for assistance with matters beyond my linguistic competence. Meir Bar-Ilan of Bar-Ilan University responded to several questions about Jewish calculations and provided me with a reference to a *Piyyut* of Ha-Qalir. David Goodblatt, my colleague at UCSD, kindly translated the relevant passage for me. Armenuhi Drost-Abgarian of the Institut für Orientalistik at the Martin-Luther-Universität Halle-Wittemberg sent me a copy of an Armenian text difficult to obtain in the United States. Grigor Broutian at the Byurakan Astrophysical Observatory responded to a number of my questions about his work on the Armenian calendar. Timothy Greenwood, affiliated then with the Oriental Institute in Oxford, now at the University of St Andrews, responded to questions about Armenian authors and granted permission for me to use his translations of Armenian inscriptions and colophons, which were at that time posted on the internet.

I thank Martin Wallraff, then of the Friedrich-Schiller-Universität Jena, now at the Universität Basel, for the outstanding conference he organized on Julius Africanus in Eisenach in May of 2005. Richard Burgess of the University of Ottawa was present. His comments on my reconstruction of the chronological system of Africanus led me to revise my views substantially.

I want to thank my mentor and friend Charles Fornara in the Department of Classics at Brown University. He had no direct role in this project, but his influence upon it is great. It was he who first taught me to love the study of history. I have applied one of his most important lessons throughout this study—work from the sources and worry about the scholarship later.

The readers for Oxford University Press made several suggestions for improvements and corrections in my text. I am especially indebted to Leofranc Holford-Strevens for his detailed commentary on the penultimate draft, as well as his many helpful comments and corrections during copy-editing.

The Bodleian Library at the University of Oxford granted permission for use of the image on the cover, MS Digby 63, fo. 6^{r}. This is a page from St Bede's 532-year continuation of the Easter table of Dionysius Exiguus, showing the data for the years AD 754–78.

Finally and especially, I want to thank Mary, my wife of 36 years, for her patience and support during the several years I have been at work on this project.

Alden A. Mosshammer

Prescott, Arizona

Contents

List of Tables

Abbreviations

A&A	*Astronomy and Astrophysics*
AJP	*American Journal of Philology*
BZ	*Byzantinische Zeitschrift*
CIArm	*Corpus inscriptionum Armenicarum* [*Divan Hay Vimagrut'yun*], ed. H. A. Orbeli et al., vols. i–ii, iv–viii (Erevan, 1960–99)
CIG	*Corpus inscriptionum Graecarum*, 4 vols. in 11 (Berlin: G. Reimer, 1828–77)
CP	*Classical Philology*
CSEL	*Corpus scriptorum ecclesiasticorum Latinorum*
CSHB	*Corpus scriptorum historiae Byzantinae*
DOP	*Dumbarton Oaks Papers*
FGrHist	*Die Fragmente der griechischen Historiker*, ed. F. Jacoby (Berlin: Weidmann, 1923; Leiden: E. J. Brill, 1926–55)
JAOS	*Journal of the American Oriental Society*
JBL	*Journal of Biblical Literature*
JHA	*Journal for the History of Astronomy*
JHS	*Journal of Hellenic Studies*
JRASC	*Journal of the Royal Astronomical Society of Canada*
JRS	*Journal of Roman Studies*
LNPNF	*Library of Nicene and Post-Nicene Fathers*
Series One	*A Select Library of the Nicene and Post-Nicene Fathers of the Christian Church,* ed. Philip Schaff, 14 vols. (Buffalo and New York: The Christian Literature Company, 1886–90)
Series Two	*A* Select *Library of Nicene and Post-Nicene Fathers of the Christian Church. A New Series*. ed. Philip Schaff and Henry Wace, 14 vols. (New York: The Christian Literature Company and Oxford: J. H. Parker, 1890–1900)
JThS	*Journal of Theological Studies*
MGH	*Monumenta Germaniae Historica*
PG	*Patrologia Graeca. Patrologiae cursus completus: series Graeca*, ed. J. P. Migne et al. (Paris, 1857–87)

PL	*Patrologia Latina. Patrologiae cursus completus: series Latina*, ed. J. P. Migne et al. (Paris, 1844–1902)
PRIA	*Proceedings of the Royal Irish Academy*
RE	*Paulys Real-Encyclopädie der classischen Altertumswissenschaft* (Stuttgart, 1894–1972)
VC	*Vigiliae Christianae*

Part I

Contexts

1

Introduction

1. THE THIRD MILLENNIUM

The arrival of the third millennium in the western calendar and the debate over whether the year 2000 or 2001 should mark its beginning occasioned a plethora of newspaper columns and internet conversation dedicated to the topic.

Thanks to all of this interest in the new millennium, one of the few relatively well-known facts from late antique Roman history is that it was Dionysius Exiguus who introduced our now 'common era' reckoned from the birth of Jesus—*anno domini nostri Jesu Christi*, the year of the Lord Jesus Christ. A notice on the website of the Royal Observatory represents the prevailing wisdom.

> Early in the 6th century AD, Dionysius Exiguus (Denys the Little), a monk and astronomer from Scythia (now SW Russia), compiled a table of dates for Easter in terms of the Diocletian calendar. He decided to reset the system of counting years to honour the birth of Christ so that the year 248 Anno Diocletiani became the year 532 Anno Domini Nostri Jesu Christi, known as 532 AD for short. In his scheme he believed that Christ was born on the 25th of December of the year preceding the start of the year 1 AD. There is no year 0 AD preceding the year 1 AD. Indeed, the concept of counting from zero, rather than one, does not exist in Latin and was introduced into Europe from the Middle East many centuries later. Therefore, Dionysius' calendar places the birth of Jesus Christ at the end of the year 1 BC. However, modern research indicates that Christ was probably born in 6 BC and certainly by 4 BC, when Herod died. (www.nmm.ac.uk/server/show/conWebDoc.2939/viewPage/2, accessed 12 August 2006.)

The general assumption is that Dionysius calculated the date of the birth of Jesus, but that he made a mistake. The notice of the Royal Observatory implies that Dionysius' 'scheme' was erroneous. The similar article on the website of the United States Naval Observatory is more blunt.

> Thus, Dionysius' Anno Domini 532 is equivalent to Anno Diocletiani 248, so that a correspondence was established between the new Christian era and an existing system associated with historical records. What Dionysius did not do is establish an accurate date for the birth of Christ. (http://aa.usno.navy.mil/faq/docs/millennium.php, accessed 31 January 2008.)

2. THE PRESENT STUDY

This study investigates the claim that Dionysius Exiguus not only introduced the Christian era as a system of consecutive numbering of the years, but also himself independently calculated the date of Jesus' birth and in doing so made a mistake. Much of the information about Dionysius in such standard reference-works as the *Catholic Encyclopedia* and the *Encyclopaedia Britannica* is wrong, often perpetuating scholarly errors of the early modern period. None of the hypotheses that have been offered as to how Dionysius established his date for the birth of Jesus is convincing. In fact, Dionysius may well have adopted an already established date, so that it is to his sources that we must look for a solution to the so-called 'Dionysian problem'.

Dionysius' counting of the years from the coming of the Lord is embedded in an Easter table. One must therefore try to understand the history of Easter calculations prior to the sixth century before dealing directly with the question of how Dionysius derived his equation between the 248th year from Diocletian and the year 532 from Christ. In investigating that history, I found it difficult to understand the basis upon which many oft-repeated scholarly claims have been made. I came to the conclusion finally that the evidence has been misinterpreted and that much of the history of the Easter calculations of the early Christian church must be rewritten. What began as a study of the origins of the Christian era has therefore become as much a study of the origins and history of the Easter calculations.

In addition to the more general chronological studies that will be mentioned at the beginning of Ch. 2, the most important modern studies of the Easter calculations include the following.

Bruno Krusch published in 1880 at the age of 23 a pioneering study of the 84-year Easter cycle used at Rome before the time of Dionysius Exiguus. Part 2 of that book includes new critical editions of many of the most important ancient texts, and I frequently cite the evidence by reference to those editions. More than 50 years later, in 1938, Krusch published a new critical text of the Easter table of Dionysius Exiguus and the documents that accompanied it.

The Irish priest and classical scholar Bartholomew Mac Carthy wrote the most comprehensive study in English of the various methods of Easter calculations as part of his introduction to *The Annals of Ulster* in 1901. Eduard Schwartz, the most distinguished German scholar in the field of church history in the first half of the twentieth century, published an important comprehensive study in 1905.

Charles W. Jones surveyed ancient and early medieval computistical studies in the introduction to his 1943 edition of the chronological works of St Bede. The French scholar Venance Grumel (1958) devoted much of the narrative portion of his work on Byzantine chronology to the history of Easter calculations between the third and the seventh centuries. In 1977 August Strobel (1930–2006), Professor of New Testament and early Christianity at the Augustana theologische Hochschule of Bavaria, published a massive study of the ancient evidence for the date of the Passion, which includes many valuable contributions to the history of Easter calculations.

More recently, Faith Wallace included a useful short survey in the introduction to her translation of Bede's *De temporum ratione* ('On the Reckoning of time,' Liverpool, 1999). An excellent synthesis in English also appeared in the essay by Georges Declercq, professor of medieval studies at the Université Libre de Bruxelles, on the origins of the Christian era, published in 2000 to greet the new millennium. Professor Declercq also prepared, again in English, a less comprehensive, but thoroughly annotated and very valuable version of his work in a lengthy article published in the journal *Sacris Erudiri* in 2002.

I often disagree with the comments and conclusions of these and other scholars. I have nevertheless learned much from their work and could not have undertaken this study without it.

The book is divided into four parts. Part One consists of this chapter and other information to introduce the reader to ancient chronological systems and to the reasons that Easter is a mobile holiday whose date depends on the phases of the moon. Part Two discusses the work of Dionysius Exiguus and analyses through that work the technical elements of an Easter table. Part Three is a history of Easter calculations in early Christianity, from the earliest such efforts in Alexandria and Rome during the third century until the emergence of the classical Roman and Byzantine cycles in the sixth and seventh centuries. Part Four investigates the origins of the Christian era within that history.

Much of this study is necessarily highly technical and abstruse, in matters chronological, computistical, and textual. The topic, however, is one of general interest. I have endeavoured to make the discussion accessible to the interested reader who may have little background in ancient history. Since many of the conclusions are new and some of them contradict a long history of scholarship, I have also endeavoured to provide full documentation of the evidence and an appropriate rehearsal of previous scholarship.

3. DIONYSIUS EXIGUUS

About Dionysius himself we know little.[1] The wealthy Roman senator and Christian patron Cassiodorus was a personal friend and erstwhile student of

[1] For a biography, see Duta 1999.

Dionysius. In his 'Institutes of Divine and Secular Learning', Cassiodorus informs us (1. 23. 1) that Dionysius was a monk born in Scythia, but thoroughly Roman in character. He was learned in both Latin and Greek. He was so steeped in Scripture that he could give without hesitation an answer to any question whatsoever. He was as much interested in secular issues as in ecclesiastical matters. He combined wisdom with simplicity, learning with humility, eloquence with reticence. At the request of one Stephen, bishop of Solitano, he collected from Greek sources the body of canon law that, Cassiodorus says, became the standard of the Roman church. He also translated many Greek works into Latin and could render Latin into Greek with such facility that you would think the words that flowed so easily from his mouth had been written already in that language.

The author of a prologue to a continuation of Dionysius' Easter table, writing in the year 616, characterizes Dionysius as a 'most learned abbot of the city of Rome.'[2] The Venerable Bede likewise accords him the title of *abbas* (*DTR* 47. 4). As Johann Wilhelm Jan pointed out in the preface to his 1718 edition of the works of Dionysius Exiguus, 'abbas' was a title that could be conferred on any monk, but especially a senior monk who was regarded with respect.[3] The Rule of St Columban (p. 132 Walker) refers to a monastic community as consisting of 'a thousand abbots' under one archimandrite. There is no reason to believe that Dionysius was ever in fact appointed an abbot to lead a monastery.

Apart from what Cassiodorus has to say, we rely for what little information we have about Dionysius from bits and pieces in the dedicatory letters or 'prefaces' that he wrote to introduce his works. The cognomen *Exiguus* appears in the salutation of several of these letters. One, introducing his collection of papal decretals, is headed, 'Dionysius Exiguus to my venerable Lord Julian the presbyter' (p. 45 Glorie). If in fact Dionysius himself took this name, it is more likely that he did so out of monastic humility, than because he was in fact short of stature, as the Royal Observatory and many similar notices suggest. In a letter addressed to Pope Hormisdas, introducing his collection of conciliar canons, Dionysius refers to himself as 'my smallness (*mea parvitas*)' in contrast to the 'beatitude' of Hormisdas (p. 51 Glorie). Such epithets are no more than a literary convention and imply nothing about a person's physical size.

It is possible that Dionysius never actually referred to himself as 'Exiguus' and that the appearance of this name in the headings of some of his writings is the work of later editors and scribes. Cassiodorus does not use the epithet.

[2] *PL* 129. 1330; Krusch 1938: 86–7; Jones 1943: 73–4.

[3] Jan 1718, *PL* 67. 519; cf. Mähler 1969: 30.

The earliest reference to Dionysius as 'exiguus' appears in a letter of the English abbot Ceolfrid, written shortly after AD 700 and quoted in Bede's *History of the English Church and People* (*HE* 5. 21). Bede himself, however, refers to Dionysius only as 'abbot' (*DTR* 47, 65).

Cassiodorus says that Dionysius was a native of Scythia. The ancient region known as Scythia was huge. Jordanes, a younger contemporary of Cassiodorus, whose *History of the Goths* summarizes a now lost work of Cassiodorus, defines Scythia as reaching from the headwaters of the Danube across eastern Europe and the Caucasus to the Caspian Sea.[4] Dionysius addressed the preface to his translation of two letters of Cyril of Alexandria to the monks Joannes and Leo, apparently former colleagues in his homeland. Dionysius refers to his own Scythian origin and remarks that Scythia produces men of great warmth and nobility of character despite the cold winters and the presence of barbarians (p. 55 Glorie). Joannes and Leo are known from other sources to have been from the region of the Roman city of Tomis, near the modern Constanta at the mouth of the Danube in Romania (Mähler 1969: 31). According to the poet Ovid (*Tristia* 3. 9. 3), who died in exile there about AD 17, Tomis was originally a Greek colony, founded from Miletus.[5] Ovid claims (*Tristia* 5. 7. 51) that the area had become so barbarized that the Greek language was little spoken there in his time, but he probably exaggerates. By the time of Dionysius, the region was thoroughly Romanized, but Greek was probably still spoken—hence the proficiency of Dionysius in both languages.

Dionysius worked in Rome from about 500 to about 540. In the letter to Julian the presbyter he praises Pope Gelasius as one whom Dionysius did not have the privilege of seeing in the flesh (p. 45 Glorie). According to the list of Popes preserved in the *Liber Pontificalis* (51), Gelasius died in 496. Dionysius was certainly in Rome by the time of Pope Hormisdas, whom the *Liber Pontificalis* (54) dates from 514 to 523. We do not know how long Dionysius worked at Rome nor whether he also worked elsewhere, but he had passed away by the time that Cassiodorus wrote the *Institutes* in the 550s.

The Easter table for which he is now so famous was one of the least of Dionysius' achievements. Cassiodorus does not mention the work in his praise of Dionysius, although Cassiodorus himself, or someone within his circle, in a treatise on calendrical rules, was the first to adopt the system of numbering the years *ab anno Domini*. This *Computus Paschalis* is based on the rules that Dionysius appended to his work. The author uses the year 562 as his example (*PL* 69. 1249).

[4] Jordanes 5. 30; see O'Donnell 1982.
[5] For the date, see Jerome, *Chronicle*, p. 171 Helm.

As we learn from Cassiodorus, Dionysius was better known in his own time for his translations into Latin of a number of Greek patristic works, including the *Creation of Man* of Gregory of Nyssa and an anonymous *Life of Pachomius*. It was also Dionysius who published the first comprehensive edition of the canons of the ecclesiastical councils, as well as a collection of papal decretals from Siricius (384–99) to Anastasius II (496–8).[6]

4. THE CHRISTIAN ERA

In the preface to his Easter tables, Dionysius says that he drafted five 19-year cycles to generate a list of Easter dates for a total of 95 years. The list serves, he says, as a continuation of a 95-year table based on calculations made in Alexandria of Egypt, in which the years had been numbered from the year 153 since the accession of the Roman emperor Diocletian to the year 247. At the time of his writing, Dionysius says, there are still six years remaining in that list. Instead of beginning his own table with the year 248, Dionysius says that he decided to designate the years as numbered from the Incarnation of Christ. The list that Dionysius composed begins with the year 532. We can deduce therefore that it was in the year 525 that Dionysius completed his work and wrote the prefatory letter. Dionysius also attached some computational rules to his tables. In these rules he uses the present year as an example, designating it as the year 525 of the Incarnation and the year when Probus held the office of consul at Rome.

Dionysius neither intended nor imagined that this system of numbering the years since the Incarnation would have a use outside Easter tables and eventually become a standard for both historical chronology and official documents. The numbering of the years since Diocletian was not itself a standard of chronological reference, except in Egypt and in the Easter tables of Alexandria. Apart from the preface and the rules appended to the 95-year list, Dionysius does not mention years numbered from the Incarnation anywhere in his writings. C. W. Jones claimed (1943: 69) that Dionysius himself dated by reference to the indictional year. This is no more the case than that he dated by years from the Incarnation. In fact, Dionysius never expresses dates at all, except in a letter addressed to the Papal chancellor (and future Pope) Boniface. The letter deals with some questions about Easter calculations. In it Dionysius designates the present year as the 14th of a 19-year cycle and the fourth year of an indictional cycle (Krusch 1938: 84).

[6] For a full list of Dionysius' writings, see Mähler 1969: 32–7.

He is discussing a question relevant to the Easter moon of that year, and the dating formula is no more than a reference to the last cycle of the table that he continued. The table included a column numbering the years within the 15-year cycle known as the Indiction. Dionysius reproduced the last 19 years of the table that was about to expire. The 14th year is numbered as Diocletian 242, Indiction 4. We can deduce that Dionysius was referring to the Easter moon for the year AD 526. In the time of Dionysius dating by reference to the names of the consuls at Rome was still the official standard. His designation of the year 525 as the consulship of Probus shows that the consular year—not the Indiction, much less the years of the Lord—was Dionysius' own standard of reference.

2

Chronological Systems

Joseph Scaliger established the foundations of modern scientific historical chronology with the publication in 1583 of his *Opus de emendatione temporum* ('On Correct Chronology').[1] The Jesuit chronologist Denis Petau (Dionysius Petavius) published his own *Opus de doctrina temporum* in 1627, a far superior work. Petau devoted his first five books to refutation of Scaliger's work, to whom he often refers with such epithets as 'hallucinator' and 'mendacious inventor' (Conley 2004: 176). Nevertheless, his own chronological research would not have been possible without Scaliger's pathbreaking example. Another Jesuit historian, Antoine Pagi, made valuable contributions to chronological studies in his four volumes of critical annotations to the ecclesiastical history of Cardinal Caesar Baronius of Naples (1538–1607). The first volume, including his *Dissertatio de periodo Graeco-Romana*, was published in 1689; the remaining three were published posthumously in 1705. Joannes van der Hagen published a series of important chronological studies in the 1730s. Ludwig Ideler summarized the state of scholarship in the early nineteenth century in his comprehensive two-volume *Handbuch der mathematischen und technischen Chronologie* (1825–6). Ideler's volumes remain useful, especially for his references to earlier scholarship.

The standard modern reference work on ancient chronology remains that of Friedrich Ginzel, published in three volumes between 1906 and 1914, under the same title as Ideler's work. A less comprehensive, but useful and accessible handbook in English is E. J. Bickerman's *Chronology of the Ancient World*, published in 1968. Also useful for the topics they cover are Wilhelm Kubitschek's *Grundriß der antiken Zeitrechnung* (Munich, 1928) and A. E. Samuel's *Greek and Roman Chronology: Calendars and Years in Classical Antiquity*, which supplemented and updated Kubitschek's work in 1972. To these handbooks may now be added the recent (2005) book by Robert Hannah, *Greek and Roman Calendars: Constructions of Time in the Classical World*. In Part II of *The Oxford Companion to the Year*, Leofranc Holford-Strevens provides an excellent introduction to calendars and chronology.

[1] On Scaliger and his work see Grafton 1983.

Much of this material is also available separately in his *History of Time: A Very Short Introduction* (Oxford University Press, 2005).

This chapter offers a brief introduction to the chronological systems that the reader will encounter in this book. Here, as throughout this study, I shall cite the evidence and try to explain it, rather than simply referring the reader to one or another of the handbooks.

1. THE EPONYMOUS YEAR

The Romans and many other ancient peoples, including the Athenians, did not number their years as we do, but instead designated the year by the name or names of the chief magistrates. Scholars call such officials 'eponymous'—the people after whom the year was named. In Athens, the year was designated by the name of the person selected each year to serve as chief archon. The archon took office in the summertime, so we designate archon years by reference to two of our Roman years. According to the Parian Marble, a chronicle inscribed at Paros in the third century BC and our earliest source for the chronology, the annual archonship was established at a year corresponding to 684/3 BC or 683/2, depending on how one interprets the numerals on the stone. Later sources give the name of the first annual archon as Creon.[2] Earlier scholars accepted 683/2 as the year of Creon, and many still prefer that date.[3] According to the tradition, the annual archons were preceded by seven archons who held office for ten years each.[4] Dionysius of Halicarnassus, who was an expert in matters chronological and wrote a history of the early Roman republic in the first century BC, says (*Antiquities* 1. 71) that the first year of Charops, the first of these decennial archons, corresponded to the first year of the seventh Olympiad, 752/1 BC. Accordingly, Creon's year must have been 682/1 (Cadoux 1948: 88–90), at least in chronographic texts of the Hellenistic period (see Ch. 15). Dating by reference to the names of the archons continued well into Roman times. The Christian chronicler Julius Africanus, for example, ended his work at the 250th Olympiad, AD 221/2, which he designates also as the archonship of Philinus.[5] The only continuous portion of the list of archons still extant is that preserved for the period between 480 and 302 BC in the work of Diodorus Siculus. Diodorus wrote a universal history from mythical times to the time of Julius Caesar, of which only portions have survived.

[2] Parian Marble, *FGrHist* 239 A32; Velleius Paterculus 1. 8. 3.
[3] Clinton 1834: 182; Samuel 1972: 198; Sickinger 1999: 47–51; Develin 1989: 27 (684/3 BC).
[4] Eusebius, *Chronicle*, pp. 85–8 Karst, in an excerpt from Castor of Rhodes.
[5] Syncellus 251. 24–9; see Ch. 17.

The Romans restricted the power any one magistrate could wield by electing two chief officials, probably known originally as Praetors, but in historical times given the title of Consul. The Romans maintained an official list of these consuls, beginning with Junius Brutus and Tarquinius Collatinus. A list of the consuls was inscribed on a triumphal arch some time between 30 and 17 BC. In this list, known as the *Fasti Capitolini*, of which fragments have survived, every tenth year was numbered from a putative date for the foundation of the city, with a base-date corresponding to 752 BC.[6] In most versions, however, the list is not numbered. The numbers that appear in modern published lists are editorial additions for the convenience of the reader.

Even after Rome came under the autocratic rule of emperors, two consuls continued to be named for each year; and the names of the consuls remained as the official system of dating in the Roman world until shortly after Dionysius Exiguus published his Easter tables. Dionysius dates his own work by reference to that system. He informs us in some of the rules appended to his table that the present year was the consulship of Probus and the year 525 from the Incarnation. Dionysius names only one consul, because by his time there was one consul for Rome, another for Constantinople.

The emperor Justinian, in an edict dated to 31 August of his own 21st regnal year (AD 537), decreed that henceforward all documents should be dated by reference to the emperor's regnal year, the consular year, and the Indiction.[7] Amid the disturbances and growing autocracy of the late empire, consular appointments had become irregular, and they ceased altogether shortly after Justinian issued this decree. Some versions of the list end with Lampadius and Orestes in AD 530, others with Basil as sole consul in 541.

Many versions of the consular list have survived.[8] The best of these lists is that preserved in an illustrated calendrical manuscript known as the *Chronograph of 354*.[9] For the period after 354, we have the list of consuls preserved in the chronicle of Prosper (AD 29–455, Mommsen 1892: 410–85) and in the manuscripts of the Easter table of Victorius of Aquitania (Krusch 1938: 37–52), who used Prosper's consular lists, including several of Prosper's errors. The lists begin with Fufius Geminus and Rubellius Geminus, whose year corresponded to AD 29, the traditional Roman date for the Passion, in the list from the *Chronograph*

[6] For the list, see Degrassi 1954, who dates its construction to 30; Lily Ross Taylor (1946, 1950) has argued for a date about 19 BC.

[7] *Novella* 47; decrees issued after the publication of the Justinian Code are known as *novellae;* published in *Corpus Iuris Civilis*, vol. iii.

[8] Mommsen 1892: 50–61, 196–499; 1898: 497–551.

[9] Mommsen 1892: 13–148; on the illustrated calendar, see Salzman 1990.

of 354. Prosper numbered his last year, the consulship of Valentinianus VIII and Anthemius, AD 455, as 428 from the Passion. The year of the Passion would therefore correspond to AD 28. That Victorius followed Prosper in this error is clear from his notation for the weekday of 1 January as a Thursday.

Victorius published his table in AD 457. He calculated dates for Easter down to the year 559, and later copyists added the consular names through to the end. After AD 541, the years are numbered 'after the consulship of Basil'. A Greek version of the consular list survives in the seventh-century work known as the *Chronicon Paschale* or 'Paschal Chronicle'.[10] This is a text dating from about 630, which will be frequently cited throughout this study. The work consists of a synopsis of events from Adam to the 20th year of the emperor Heraclius (630), dated for the historical period by reference to numbered Olympiads, the names of the Roman consuls, and for the period after 49 BC, by indictional years. The consular list ends with Basil. Preceding the narrative is a prefatory text in which the author discusses Easter calculations—hence the modern title. A few pages are missing from the manuscript at both the beginning and the end.

In addition to these lists, we have consular names from the extant portions of the Roman histories of Dionysius of Halicarnassus and Livy, both of whom worked in the late first century BC and named the consuls for each year in their narratives. There are significant differences among the various versions of the lists for the earliest period of the Roman Republic. The lists come into general agreement from the third century BC onwards. According to a summary of the otherwise lost 47th book of Livy, it was not until the year corresponding to 153 BC that the Roman consuls entered upon their office on 1 January. A note to the same effect appears at 1 January in the inscribed calendar of the first century AD known as the *Fasti Praenestini* (Degrassi 1963: 107–45).

Livy (22. 1) says the consuls for the year 217 BC entered office on 15 March. This seems to have become the regular date in 222 BC. Plutarch (*Marcellus* 4) says that Gaius Flaminius, one of the consuls for the year 223, was recalled early and forced to resign immediately after he celebrated his triumph over the Gauls. The *Fasti Triumphales*, inscribed about 12 BC, preserves a list of triumphs from the first year of the city until 19 BC (Degrassi 1954: 91–110). Flaminius celebrated his triumph on 10 March 222 and his colleague Publius Furius on 12 March. The new consuls probably took office on 15 March.

The consul for 252 celebrated a triumph on 13 April 251. The regular date before 222 may therefore have been 1 May. Livy (8. 20) reports consuls entering office on 1 Quinctilis (July) in the year corresponding to 341 BC.

[10] On the *Chronicon Paschale*, see Ch. 13; for the consular list, Mommsen 1892: 205–47.

At the year 463 BC, he says (3. 6) 1 Sextilis (August) was the beginning of the consular year at that time.[11]

Chroniclers treated the consular year as synchronous with the calendar year, and retrojected 1 January into the earliest years of the Republic. Dionysius of Halicarnassus says (*Antiquities* 5. 1) that Brutus and Collatinus were the first consuls after the expulsion of the kings and that they served for four months at the beginning of the 68th Olympiad (late summer of 508 BC)—that is, from September through December.

2. THE NUMBERED OLYMPIAD

Beginning in the middle of the third century BC—but only in literary texts, never officially—historians and chroniclers supplemented the 'eponymous' dating by referring also or instead to a numbered Olympiad. The Olympic festival was celebrated in the summer every four years. The Roman calendar begins in January, so Olympiad dates are expressed by reference to two Roman years. The first Olympic festival was supposedly celebrated in the summer of 776 BC, and the first Olympiad year therefore corresponds to 776/5 BC. To be precise, a writer could give both the number of the Olympiad and the number of the year within the four-year cycle. Earlier annalistic sources, including Diodorus Siculus and Dionysius of Halicarnassus, numbered only the Olympiads themselves and designated the individual years within an Olympiad by the name of the archon at Athens.

A fragment of the Alexandrian scholar Eratosthenes (*c.*225 BC) tells us that there was a total of 407 years from the fall of Troy to the last year before the first Olympiad, an interval of 297 years from there to the attack upon Greece by the Persian King Xerxes, another 48 years to the Peloponnesian War, and a total of 108 years from there to the death of Alexander the Great.[12] The Athenian historian Thucydides says (2. 2, 2. 28) that there was an eclipse of the sun during the first summer of the Peloponnesian War, which broke out several months earlier during the archonship of Pythodorus. The eclipse is dated astronomically to 3 August of the year corresponding to 431 BC.[13] Therefore the archonship of Pythodorus and the beginning of the Peloponnesian war belong to the year 432/1 BC. Eratosthenes counted an interval of 345 years from the last year before the first Olympiad to the beginning of the

[11] For a thorough review of the evidence, see Mommsen 1877: i. 572–87.
[12] Eratosthenes, *FGrHist* 241 F 1 = Clement of Alexandria, *Stromata* 1. 21. 138.
[13] Espenak and Meeus 2006: #03764.

Peloponnesian War. The last year before the first Olympiad was accordingly 777/6 BC. The first year of the first Olympiad began in this chronological system in the summer of 776 BC. Whether the first Olympic festival was in fact observed in that year is another question entirely. Eratosthenes presumably used the year before the first Olympiad as a chronological epoch, because it marked the end of the period for which there was no reliable chronology. Early Christian writers adopted this reckoning by Olympiads. Julius Africanus, the first Christian chronicler, published a world history that ended with the consulship of Seleucus and Gratus (AD 221) and the 250th Olympiad, AD 221/2 (Syncellus 252. 24–9). His work has not survived, but later authors cite it as dating the Passion to the second year of the 202nd Olympiad, which corresponds to the Roman year beginning in the summer of AD 30 and ending in the summer of 31.[14]

By the time of Dionysius Exiguus, the *Chronicle* of Eusebius had become the standard of chronological knowledge. It remained so until the beginnings of modern historical scholarship in the sixteenth century. Eusebius was bishop of Caesarea in Palestine and a participant in the First Ecumenical Council at Nicaea in 325. Among many other works, he wrote the first history of the Christian church and a *Chronicle* that covered human history from the time of Abraham to the 20th year of Constantine (AD 325), the first Christian emperor. St Jerome translated the work into Latin and extended it to the year corresponding to AD 378. Eusebius organized his work by years from Abraham numbered every tenth year and, beginning with the year 1241 from Abraham, by Olympiads.

The Olympic festival was not celebrated each time on exactly the same date in our fixed solar calendar, nor did the civil years of the various cities coincide either with each other or with the Olympic year. The Athenian year, for example, began during the Roman month of June or July and the Olympic year began a few weeks thereafter. The exact dates varied, depending on the phases of the moon and how the local authorities regulated the calendar.

The Athenian calendar began on the 1st day of the month of Hecatombaeon, theoretically at the first new moon after the summer solstice. Actual practice remains the subject of scholarly debate.[15] The Olympic festival was held every four years in the territory of Elis and in accordance with the Elean calendar. A Hellenistic commentator on the *Odes* of Pindar says that the Elean civil year began with a new moon at the approximate time of the winter solstice and that the Olympic festival was observed at the time of the full moon in the eighth month.[16] Stephen Miller (1975) has argued that the

[14] Syncellus 392. 1–16; see Ch. 17.
[15] Bickerman 1968: 34–8; Hannah 2005: 42–52.
[16] Scholion, *Olympian Odes* 3. 35; see Ginzel 1906–14: ii, 354–6; Hannah 2005: 35–40.

Olympic festival was scheduled to coincide with the second full moon after the summer solstice—therefore July or August.

A chronicler who dated by Olympiads would need for practical purposes to synchronize the Olympic year with some standard civil calendar. Earlier chroniclers like Eratosthenes apparently used the Athenian civil year. We do not know for certain what calendar Christian writers like Africanus and Eusebius used as their standard. One widely used calendar was the Macedonian calendar adopted in one form or another in most near eastern cities after the conquests of Alexander the Great and his successors. In that calendar, the civil year began on 1 Hyperberetaios (October) in Antioch, a week earlier in some cities. In their chronological handbooks, both Ginzel and Bickerman state that use of the Macedonian calendar led to a first Olympiad corresponding to 777/6, rather than 776/5.[17] That is, such a chronicler would have said, for example, that the 87th Olympiad, which was observed in August of 432 BC, was celebrated during the Macedonian year corresponding to 433/2, and would have synchronized the first year of the Olympiad for chronological purposes with a year that began in October of 433. Therefore the beginning of the Peloponnesian War in March of 431 would be dated to the second year of the 87th Olympiad, instead of the first. Ginzel cites Julius Africanus as an example of such a chronicler. Richard Burgess (1998: 28–35) has recently argued that Eusebius used such a calendar and that all of his Olympiad dates should be interpreted in this way.

The statements of Ginzel and Bickerman derive from claims made in several articles in the late nineteenth century by Georg Friedrich Unger (1881, 1886, 1895). These claims have no real basis in the evidence. Burgess's conclusions for Eusebius rest on evidence that can as easily be interpreted as suggesting that Eusebius used the Roman civil year and distinguished it from an Olympiad-year with an epoch corresponding to 776/5 BC. If a chronicler synchronized his Olympiads with the Alexandrian year, which began during the period of the Roman empire at a date corresponding to 29 August, or with a Macedonian year beginning about 1 October, he would have done so such that the Olympiad year began a few weeks later than the actual celebration, not ten or eleven months earlier. Throughout this study, I assume a 'standard' Olympiad, with an epoch corresponding to 776/5 BC.[18]

We know from later legal sources that the emperor Theodosius I (379–95) issued in 391 a decree forbidding any person to approach a pagan shrine or enter the temples.[19] Such strictures had the effect of abolishing the Olympic

17 Ginzel 1906–14: ii, 358; Bickerman 1968: 76.
18 See Ch. 17 and Mosshammer 2006.
19 Theodosian Code 16. 10. 10.

games. The Byzantine chronicler George Cedrenus (*c*.1075) informs us (i. 573. 1–2) that the Olympic festival ended in the time of the emperor Theodosius. Cedrenus reports this fact just before he informs us of the death of Theodosius after 16 years of rule in the year corresponding to AD 394/5. Ginzel (1906–14: ii, 358), apparently following Ideler (1825–6: i. 377), says that the last Olympiad was precisely the 293rd in the year AD 393. Cedrenus says no more than that the festival began when Manasseh was King of Judah and lasted until the time of Theodosius. It seems unlikely that any official festival could have been held after the decree of 391. A recently discovered inscription at Olympia shows that games were held for the 291st Olympiad, AD 385 (Ebert 1997). We know of no observance after that date.

Cedrenus says that after the cessation of the Olympic festival, Indictions began to be numbered instead of Olympiads. The *Chronicon Paschale*, however, continues to enter the numbered Olympiad every fourth year on through to where the manuscript ends at the 352nd Olympiad. Other medieval chroniclers continue the system even further. The Armenian chronicler Samuel of Ani wrote a continuation of the *Chronicle* of Eusebius ending with the year that he designates as the second of the 489th Olympiad, the year 1179 from Christ (*PG* 19. 741).

3. REGNAL YEARS AND THE ASTRONOMICAL CANON

The sources sometimes express dates as a numbered year within the reign of an emperor or king. The Gospel according to Luke, for example (3: 1, 23), says that it was during the 15th year of the emperor Tiberius that Jesus went down to the Jordan to receive baptism from John.

We have several ways of converting a regnal year to an absolute date. The Roman imperial biographer Suetonius (*Augustus* 100. 1) says that Tiberius became emperor upon the death of Augustus on 19 August during the consulship of Pompeius and Appuleius, whose year corresponds to AD 14. Another method is through reference to a list of rulers with the length of each monarch's reign. The most important such list—to which this study will often refer—is the list known as the 'Royal Canon' or 'Astronomical Canon'.

The astronomers in Alexandria maintained a list of rulers and the length of their reigns by reference to which they recorded observations and calculated intervals. The list continues an older Babylonian practice and begins with the Babylonian king Nabonassar, whose first year would correspond to 747 BC. The list continues with kings of Babylon, kings of the Persians, the Macedonians (i.e. the Ptolemaic kings of Egypt), and the Roman emperors beginning with Augustus at a year corresponding to 30/29 BC. Several versions of the list have survived. There is a column of regnal names followed by two columns of numbers. The first gives the number of years assigned to that person's reign, the second has a running total of the years from the beginning of the list. That count starts from Nabonassar, but begins again with 1 at the first year of Philip Arrhidaeus, the half-brother and immediate successor of Alexander the Great, at a year corresponding to 324/3 BC.[20]

As an example of the astronomical use of the list, we can take an observation of the equinox recorded by Claudius Ptolemy, a datum that will be important for the discussion in chapter 8. Ptolemy (*Almagest* 3. 1) reports an observation of the equinox by Hipparchus on 27 Mechir of the 178th year from the death of Alexander (24 March 146 BC) and his own observation 285 years later on 7 Pachon in the year 463 (22 March AD 140). The month is now Pachon, the ninth month in the Egyptian calendar, instead of Mechir, the sixth month, because both Hipparchus and Ptolemy worked with the so-called Egyptian 'mobile year' of 365 days, with no leap-year intercalation. During the 285 years between the two observations, the calendar had lost 71 days with respect to the solar year.

Monarchs do not come to power or die exactly at the beginning of a calendar year. In practice, therefore, the compilers of lists either antedated the first year of a ruler to the beginning of the calendar year during which he came to power or postdated it to the beginning of the next calendar year. Antedating is the practice of the Astronomical Canon. The list, for example, reckons the first year of Philip from the beginning of the Alexandrian calendar year at a date corresponding to 12 November 324 BC. The actual date of the death of Alexander the Great was June of 323 BC, as we know from both literary and astronomical sources.[21]

The 15th year of Tiberius is a critically important example. He became emperor shortly after the death of Augustus on 19 August AD 14. The Astronomical Canon dates his first year from 1 Thoth of the year 338 from Philip, corresponding to 20 August AD 14, in the mobile calendar. For those in the eastern empire who used a version of the Macedonian calendar of Syria (see below), the civil year began about 1 October. Thus the first year of Tiberius could be backdated to 1 October AD 13. In the Roman calendar, the first year of Tiberius could be counted from 1 January of the year of his accession, AD 14, or postdated to 1 January AD 15. A date in the 15th year of Tiberius could be as early as 1 October AD 27 or as late as 31 December AD 29. We often do not know how a particular author counted regnal years.

[20] For the lists see the edition of H. Usener in Mommsen 1898: 438–55.
[21] Diodorus 17. 113–17; Arrian, *Anabasis* 7. 28; Depuydt 1997.

4. THE FOUNDATION OF ROME

Some Roman writers numbered years or at least counted intervals from the putative date for the foundation of the city of Rome. In the Capitoline *Fasti* the date corresponds to 752 BC. Dionysius of Halicarnassus (*Antiquities* 1. 3) used a date corresponding to 751. The standard literary date came to be one corresponding to 21 April 753 BC.

Cicero (*Brutus* 72), discussing the date of the poet Livius Andronicus, tells us that there was controversy among Roman writers as to the date of the foundation of Rome. He says that his friend Titus Pomponius Atticus had dated Livius Andronicus to the consulship of Gaius Claudius and Marcus Tuditanus, in the 514th year after the foundation of the city. That consulship appears in the extant lists at the year corresponding to 240 BC, so that Atticus' date for the foundation of Rome must have been in 753 BC. Gaius Julius Solinus (third century AD), reports a variety of opinions, including that of Atticus, which Solinus says (1. 12) corresponded to the third year of the sixth Olympiad (754/3). This was the date that Marcus Terentius Varro, a contemporary of Cicero, adopted in his influential history of Roman antiquities. Varro's work unfortunately exists only in scattered fragments. Censorinus, a Roman scholar of the third century AD, wrote a treatise that preserves many valuable data on ancient calendars. Citing the authority of Varro, Censorinus (21. 5) reckons the consulship of Ulpius and Pontianus (AD 239) as 1014 years from the first Olympiad, counting the Olympic year as beginning in the summer, and 991 years from the foundation of the city, counted from the festival of the *Parilia* (21 April). The interval of 991 years from 21 April AD 239 leads to 21 April 753 BC as the date of the foundation of Rome. The interval of 23 years (1014–991) between the first Olympiad and the foundation of Rome yields 776 BC for the first Olympiad.

Except in the *Fasti*, years numbered from the foundation of Rome were rarely used officially. Years *ab urbe condita* (AUC) appear as a system of historical chronology only in a few literary works. Cornelius Nepos, for example, wrote a *Chronicle*, now lost, in which he seems to have expressed his dates both by Olympiads and by years *ab urbe condita*. Pliny the Elder (*NH* 2. 53) says that Thales predicted an eclipse of the sun in the fourth year of the 48th Olympiad (585/4 BC) and the year 170 from the foundation of Rome. Pliny's source was probably the *Chronicle* of Nepos. The synchronism between Olympiad 48.4 and 170 AUC implies Olympiad 7.2 for the foundation of Rome. Solinus (1. 12) says that Nepos' date for the foundation of Rome was indeed the second year of the seventh Olympiad.

Among the few ancient works of history to use the system AUC is the epitome of Roman history by Eutropius, an author of the fourth century

AD. He dates (1. 1) the foundation of Rome to 21 April in the third year of the sixth Olympiad. Orosius, a Spanish native who became a protégé of St Augustine, wrote, at his suggestion, seven books of history 'Against the Pagans', covering human history from Adam to AD 417. He also uses numbered years from the foundation of Rome. Orosius (6. 22. 5) dated the birth of Christ to the year 752 of Rome.

5. THE NUMBERED INDICTIONAL YEAR

The presence of the numbered Indiction in the Easter table of Dionysius Exiguus is among its earliest uses in the Latin speaking world. It was not until 537 that Justinian issued the decree requiring the use of indictional dates. Thereafter the Indiction was the single most widely used system of official dating in medieval times. It continued in use in the Holy Roman Empire until the Napoleonic Wars (Bickerman 1968: 79).

The 'Indiction' is literally a tax assessment. Theoretically, the indictional cycle is the 15-year period between tax assessments in a fiscal system dating from the reign of the emperor Diocletian (284–305).[22] The term 'Indiction' itself first appears in Egyptian documents dating from the year 297, although the standard 15-year cycle had not yet emerged.[23] In the fully developed system, an indictional date is a number from 1 to 15. The indictional periods themselves are usually not numbered, so that an indictional date is useless in itself without reference to some other system such as the name of the emperor.

The base-date of the system was AD 312/13. The earliest historiographical source is the *Chronicon Paschale* (354. 17–355. 18). At the first year of the 183rd Olympiad, 48/7 BC, the author states that Julius Caesar was proclaimed as Dictator in Antioch on the 23rd day of the month of Artemisios (April/May). In Caesar's honour, the Antiochenes number both their own 'year 1' and the first year of the 15-year cycle of the Indictions from the first year of Julius Caesar. A few lines later and under the next year, the chronicler states that the Antiochenes number their own years from the first year of Julius Caesar and that in that year the Indictions began from the first day of the month of Gorpiaios (September). At the second year of the 203rd Olympiad, AD 314/15, which the author designates as the eighth year of the emperor Constantine, the chronicler (522. 13–16) dates the beginning of 'the Constantinian Indictions'.

22 Ginzel 1906–14: iii, 148–55; Bickerman 1968: 78–9; Grumel 1958: 192–206.
23 Bagnall and Worp 2004: 8.

The year 1 of the era of Antioch corresponds to 49/8 BC (see below). An indictional year 1 at that date is consistent with the alignment in the Easter table of Dionysius Exiguus of the year AD 532 with a 10th indictional year. On that system, the first 'Constantinian Indiction' corresponds to AD 312/13. Constantine was proclaimed emperor by his troops upon the death of his father. The church historian Socrates Scholasticus (*HE* 1. 2) dates the event to 25 July in the first year of the 271st Olympiad, 305/6. Constantine's eighth year would therefore be 312/13.

George Cedrenus says (i. 573. 4–7) that after the end of the Olympic games during the reign of Theodosius, 'The Indictions began to be numbered, beginning from Augustus Caesar in the 15th year of his reign; they are called "Indictions" from the word "inaktion," which means "the victory at Actium".' Elsewhere (303. 21), in narrating the times of Augustus, Cedrenus says that the Indiction, as well as the bissextile year (leap year), was instituted in the second year of Augustus. Most ancient authorities dated the first year of Augustus at Rome to 43 BC and his first year at Alexandria to 30/29 BC, the 14th year of his rule at Rome.[24] Thus, Cedrenus' dates in the 15th and 2nd year of Augustus converge at the year corresponding to 29/8 BC, which would not have been the first year of a cycle as we know it from sources that use the system. Cedrenus himself does not date by Indictions. He has wrongly conflated the institution of the Indiction with the introduction of the fixed Julian calendar at Alexandria. The latter event is correctly dated to the sixth year of Augustus, not the second (see Ch. 16).

One of the earliest uses of the Indiction as a dating system appears in a document associated with the Council of Sardica, which met in 343 (see Ch. 9). The first use of an indictional date in an imperial document appears in connection with a decree of the emperor Constantius dated to 15 January in a 15th indictional year, in the consulship of Constantius VIII and Julian (Theodosian Code 12. 12. 2). That consular year corresponds to AD 356, which should have been noted as a 14th indictional year. (When a Roman numeral appears in a consular date, it indicates the *n*th time that a person has served as consul.)

In a treatise written about 360, Athanasius (*De Synodis* 25) dates the council of Antioch to the consulship of Marcellinus and Probinus, in the 14th indictional year. That consular year corresponds to AD 341, and a 14th indictional year is consistent with a base-date in 312/13. A Syriac document known as 'The Athanasian Index' gives a chronological summary of the career of Athanasius, together with the date of Easter for each year (see Ch. 9). The text derives from a Greek original written most probably in the late fourth

[24] Eusebius, *Chronicle* 157 Helm; Astronomical Canon, Mommsen 1898: 448; Syncellus 376. 13.

century. The Athanasian Index dates the beginning of the episcopate of Athanasius to the 44th year of Diocletian and the first year of an Indiction, in the consulship of Januarius and Justus, AD 327/8—again consistent with a base-date in 312/13.

Roger Bagnall and Klaas Worp (2004: 1–14) have reconstructed the early history of the system from Egyptian documents. A numbered tax cycle first appears in papyri beginning from 287 in five-year intervals, with the term 'Indiction' being used only after 297. Beginning in 308/9 there are references to a continuously numbered indictional year, with the numbers counted from 292/3, which was the first year of the joint rule of the emperors Diocletian and Galerius. The numbers continue after the death of Galerius in 311, but such references lapse after 317/18. In 313/14 a new system was in effect. A document dated to the springtime of the consular year corresponding to 314 records a statement of accounts for the previous five years, numbered as indictional years 17, 18, 19, 20, and 1. The new indictional year 1 corresponds to the base-date in 312/13 that soon became standard.

It seems therefore that a system that began as a five-year numbered tax-cycle yielded first to a continuous numbering of the years since the first year of Galerius and a few years after his death to a 15-year cycle with AD 312/13 numbered as 1. Bagnall and Worp (2004: 15–21) have suggested that the numbering began in 312/13, but that the system was regularized as a 15-year cycle only in 327/8. Why the author of the *Chronicon Paschale* backdated the system to the first year of Julius Caesar we do not know.

The *Chronicon Paschale* says that the indictional year began on the first day of September. St Bede claims that the indictional year began on the eighth day before the Kalends of October—that is, on 24 September (*DTR* 48). St Ambrose of Milan, writing towards the end of the fourth century, uses the Indiction as an example of a calendar year beginning in September, but he does not specify an exact date (*On Noah and the Ark* 17. 60). Indictional dates usually agree with the Byzantine new year on 1 September, but sometimes in medieval European documents with Bede's Indiction beginning 24 September (Ginzel 1906–14: iii, 151–2). In Egypt, some documents distinguish between a local tax-year that began at the time of a preliminary assessment in the spring and an official Roman indictional year synchronized with the Alexandrian civil year beginning 1 Thoth = 29 August (Bagnall and Worp 2004: 22–35).

Scaliger suggested that 24 September was the original date of the Indiction, and that it was the emperor Justinian who adjusted it to 1 September. Ludwig Ideler rejected the hypothesis on the grounds that there is no evidence for the 24 September date before Bede.[25] As Bede informs us elsewhere, 24 September

[25] Scaliger 1629: 503–4; Ideler 1825–6: ii. 361.

is also the conventional date for the autumnal equinox in the Roman calendar.[26] Ginzel (1906–14: iii, 150) thought that Bede dated the indictional year to 24 September for that reason.

A Martyrium in Chalcedon is dated to 22 September of the consular year corresponding to AD 452, at the end of a fifth indictional year (Duchesne 1878). A fifth indictional year ending in 452 corresponds to the standard base-date in 312/13. If the indictional year began on 1 September, however, then the 22nd of September in 452 ought to have been at the beginning of the sixth Indiction, rather than the end of the fifth. This inscription suggests an indictional year beginning no earlier than 23 September. Evagrius Scholasticus, attesting to an earthquake that destroyed Antioch in September of 458, dates the event to Sunday, the 14th day of September, in the second year of the emperor Leo, the year 506 of the era of Antioch, in the 11th Indiction (*HE* 12, pp. 62–3). The 14th of September was indeed a Sunday in the year 458, and both the imperial date of Leo and the year of the city agree with that date. If the cycle of the Indictions began on 1 September of 312, however, then 14 September in 458 ought to have been the 12th Indiction.

Wilhelm Kubitschek suggested (1928: 108) that the indictional year was synchronized with the civil year and varied in accordance with local calendars. V. Grumel, author of the standard reference-work on Byzantine chronology, argued (1958: 195–201) that 23 September was the original date in the fourth century, supplanted in the fifth century by 1 September. Grumel adduced several liturgical texts, in both Greek and Slavonic, ranging in date from the tenth to the fourteenth century, which attest to a new year beginning precisely on the 23rd day of September and associating that date with the Feast of the Conception of John the Baptist. Other texts attest to the beginning of a new lectionary cycle on the first Sunday after the equinox, explaining that 'the equinox is designated as the new year'.

Grumel argued that these texts represent the conservative preservation of a liturgical year that originally began at the same time as the indictional year, on 23 September. Grumel explains the choice of that date as coinciding with the civil year in certain cities of Asia.

A table of calendars (*Hemerologium*) in a Florence manuscript, with exemplars also in Leiden and Rome, preserves in 17 columns the calendars of Rome, Alexandria, Antioch, and fourteen other cities and regions.[27] Each column lists the names of the months and the date in the Roman calendar to which the first day of the month corresponds. At Antioch and Seleucia the

[26] Bede, *DTR* 30; cf. Columella 9. 14; Pliny 18. 246, 256, 264.
[27] Ginzel 1906–14: iii, 18–34; Kubitschek 1915; Grumel 1958: 166–75, 196–7.

new year began on 1 October, while at Ephesus and in the province of Asia it began on 24 September. In Bithynia and Crete, however, the new year began precisely on 23 September.

We know the reason for the shift from 24 September to 23 September in some cities. An inscription found in the city of Priene preserves a decree adopted by 'the Greeks of Asia' in honour of the emperor Augustus and of Paullus Fabius Maximus, the proconsul of Asia. Fabius appears in the consular lists for the year corresponding to 11 BC, and his proconsulship in Asia probably followed shortly thereafter. The decree provides that henceforth all of the cities in that province shall begin their calendars with the first day of the first month, now renamed 'Kaisar' in honour of Caesar, synchronized with the 9th day before the Kalends of October, that is, 23 September, the birthdate of Augustus.[28]

Grumel argued that it was Constantine's rival Licinius, based in Bithynia, who regularized the imposition of taxes and established what later came to be known as the 'Constantinian Indiction', synchronized precisely with the Bithynian new year on 23 September. Later—perhaps in the 460s, Grumel suggests—the significance of 23 September as the birthday of Augustus and the date of a festival in his honour faded from memory. The Indiction and with it the Byzantine civil year was moved to coincide more conveniently with the Roman calendar on 1 September. Conservative liturgical practice continued for some time, however, to recognize 23 September as the beginning of the ecclesiastical year, associated now with the Conception of John the Baptist.

There is no evidence to support Grumel's attribution of the indictional system to Licinius. Kubitschek's explanation seems the more likely—the indictional year was synchronized with the civil year and varied with the local calendar, before being standardized on 1 September. Grumel may be right that the liturgical year originally began on 23 September. The reason for that date was probably always its association with the Feast of the Conception of John. The author of the *Chronicon Paschale* (368. 1–371. 7) took great care to demonstrate to his readers that the conception of the Baptist took place on 23 September. That date remains the Feast of the Conception of John the Baptist in the Greek Orthodox Church. Over some period of time, the liturgical year came to be adjusted to the Byzantine civil year beginning on 1 September and synchronized with the indictional year. That day is marked as 'Indiction Day' or 'Beginning of the Indiction' in Greek Orthodox calendars.

[28] Ginzel 1906–14: iii, 20; for a translation of the text, see Hannah 2005: 131.

6. THE SELEUCID ERA AND THE ERA OF ANTIOCH

Syriac, Arabic, and some Jewish sources number the years from the accession of Seleucus, one of the successors of Alexander the Great. Seleucus defeated Demetrius Poliorcetes at the battle of Gaza in the fall of 312 BC.[29] He counted his regnal years from that approximate date.[30] The era has various names. In the books of Maccabees, for example, dates are expressed according to 'the Greek era'.[31] Other sources designate it as the era of Alexander. The beginning of the Seleucid era varied with the local calendar. In the Macedonian calendar used in the Greek cities, the Seleucid era has a base-date corresponding to 1 October 312 BC. In a document preserved from the Council of Chalcedon (AD 451), for example, the date of the Council of Nicaea is given as the consulship of Paulinus and Julian (AD 325), the year 636 'from Alexander', on the 19th day of June in the Roman calendar, 19 Daisios in the Greek calendar.[32] Daisios was the ninth month in the calendar of Antioch. Therefore the year 636 began in October of AD 324, the year 1 in 312 BC.

The Babylonians synchronized the Seleucid era with their own calendar beginning on the first day of Nisan in the spring of 311 BC (Bickerman 1943). Claudius Ptolemy preserves some Babylonian observations dated both by reference to the era 'of the Chaldeans' and the era of Nabonassar. One example (*Almagest* 11. 7. 7) is an observation of the planet Saturn on the 5th of the Macedonian month of Xanthikos in the Chaldaean year 82, equivalent to the 14th day of the Egyptian month of Tybi in the year 519 from Nabonassar. The 14th day of Tybi in the year 519 Nabonassar corresponded to 1 March 229 BC. That date can be accommodated within the 82nd year of the Seleucid ('Chaldaean') era only if the year 1 began after 1 March 311.[33]

Seleucus founded the city of Antioch, named after his father, in 304 BC.[34] The era of Antioch was counted not from that date, but from the date of its liberation from Seleucid rule by Julius Caesar. John Malalas, a sixth-century chronicler from Antioch, says (11. 6, p. 163 Thurn) that Caesar entered Antioch on the 23rd day of the month of Artemisios and that in his honour the city counts its years from that time.

The *Chronicon Paschale* (354. 17–355. 18) says that the first year of Antioch was the first year of an indictional cycle. Since the 15-year indictional cycle has

[29] Diodorus Siculus 19. 91–2; Wheatley 1988.
[30] Ginzel 1906–14: i, 136, 263; iii, 40–3; Bickerman 1943: 73.
[31] 1 Macc. 1: 10, 2 Macc. 1: 7, and frequently throughout both books.
[32] *Concilium universale Chalcedonense*, vol. i, part 2, p. 79.
[33] Ginzel 1906–14: i, 136–7; Hannah 2005: 92–4.
[34] Eusebius, *Chronicle*, p. 127 Helm.

a base-date corresponding to AD 312/13, a first indictional year backdated to the time of Julius Caesar can only have been 49/8 BC. Epigraphic evidence confirms that date (Ginzel 1906–14, iii: 43–4). A recently discovered Syriac inscription associates the year 653 of Antioch with an eighth indictional year (Aggoula 1992: 401–6). An eighth indictional year at a date approximately 653 years after the conquests of Julius Caesar was the year corresponding to AD 604/5. The first year of Antioch must therefore have been 49/8 BC. Caesar did not enter Antioch until the spring of 47 BC. The era commemorates the victory of Caesar over Pompey at the battle of Pharsalus the previous summer. The Antiochenes backdated the year 1 to the beginning of their calendar year in autumn of 49 BC.

7. THE ERA OF DIOCLETIAN

The numbering of years continuously from the accession of the Roman emperor Diocletian is a strictly Egyptian reckoning known to Dionysius and the West only through its use in the Easter tables of Alexandria. In Egyptian papyri, the designation of a year by reference to Diocletian appears in horoscopes for birthdates ranging from year 21 to 224 (AD 304/5–507/8).[35] Since a horoscope may be cast some time after a person's birthdate and even for persons who are deceased, the horoscopes do not in themselves tell us how early the dating system came into use. The astrological treatise of Paul of Alexandria (pp. 39–41) uses as an example in a formula for determining the day of the week what he calls the 'present' day, the 20th day of Mechir in the year of Diocletian 94, which corresponds to AD 377/8. In inscriptions, the earliest example appears in connection with the cult of the Buchis bull, commemorating a sacred bull who was born in the year 33 of Diocletian and died in the year 57 (Grenier 1983). Renamed the 'Era of the Martyrs,' the reckoning continues in use in the Coptic church. The earliest appearance of that term is in a funerary inscription dated to the year 502 of the martyrs, AD 785/6 (Bagnall and Worp 2004: 67–8).

According to the *Chronicon Paschale* (510. 19–511. 6), Diocletian's troops hailed him as emperor on 17 September during the consulship of Carinus and Numerian, he entered the city of Nicomedia ten days later, and he became consul the following January. From the consulship of Diocletian and Aristobulus, the author continues, the years of Diocletian are reckoned in the Easter tables. The consulship of Carinus and Numerian corresponds to

[35] Bagnall and Worp 2004: 63.

AD 284 and that of Diocletian and Aristobulus to AD 285. Easter in the first year of Diocletian was in the spring of 285.

Diocletian officially counted his regnal years from 20 November 284 (Lactantius 17. 1). The first year of Diocletian in Alexandria was counted from the 1st day of the month of Thoth, the beginning of the civil year, corresponding to 29 August in the Roman calendar. Diocletian and his co-emperor Maximianus resigned on 1 May 305.[36] Ancient sources disagree on the date of Diocletian's death. The only contemporary source is Lactantius, in his work *On the Deaths of the Persecutors* (42. 3), who does not give a precise date, but associates the death of Diocletian with events between 311 and 313. The fifth-century *Consularia Constantinopolitana* (Mommsen 1892: 231) dates his death to 3 December 316. T. D. Barnes (1973: 32–5) has argued that 311 is the correct date and that the sources of the *Consularia* confused the consulship of Volusianus and Rufinius (311) with that of Sabinus and Rufinus (316).

Some scholars have believed that the Easter cycle of Alexandria took the form in which Dionysius knew it during the reign of Diocletian. It was for this reason, they believe, that the years were numbered from Diocletian and at least partly for this reason that an era of Diocletian came into being. In Chs. 8 and 9, I shall offer a different history of the Alexandrian cycle and with it a different explanation of the era of Diocletian.

8. THE ERA OF THE WORLD

Some Jewish and Christian authors counted years from a putative date for the creation of the world. A cosmic era as a consistent system of chronology did not emerge as such until the third century among Christian writers, the eighth century among the Jews.

Clement of Alexandria (*Stromata* 1. 21. 141) cites Eupolemus, a Jewish historian of the Maccabean period, as having reckoned 5149 years from Adam to the fifth year of King Demetrius. Eupolemus refers presumably to the Seleucid King Demetrius I Soter of Syria, whose intervention in Judaea the First Book of Maccabees (1 Macc. 7: 1) dates to the year 151 of the Seleucid era, which would be 162 BC. Thus Eupolemus dated the Creation to about 5315 BC. Clement himself (*Stromata* 1. 21. 144) counted 5784 years from Adam to the death of Commodus in AD 212, which entails a date for the Creation in 5572 BC.

[36] Lactantius 19. 1; the *Consularia Constantinopolitana* (Mommsen 1892: 231) gives the date as 1 Apr. 304.

Julius Africanus and Hippolytus, contemporaries who may or may not have been familiar with each other's work, popularized the notion that the whole of human history would last seven thousands of years. The Saviour appeared in the year 5500 (or 5501), and Christ would presumably return in the year 6000 (or 6001) to inaugurate the millennium prophesied in the Book of Revelation (20: 1–7).

A commentary on the Book of Daniel (4–6) attributed to Hippolytus states the doctrine explicitly: 'For the first appearance of our Lord in the flesh took place in Bethlehem, under Augustus, in the year 5500; and He suffered in the thirty-third year. And 6,000 years must needs be accomplished, in order that the Sabbath may come, the rest, the holy day on which God rested from all His works.' References to the Romans as Daniel's 'Kingdom of Iron' have led some scholars to believe that this commentary was written during a period of persecution. The work has therefore been dated to AD 202, to which year Eusebius dates a persecution of Christians by Septimius Severus.[37]

Julius Africanus was the first to use years numbered from Adam as the basis for historical chronology. His chronicle has not survived. George Syncellus (252. 24–9) states that Africanus dated the Incarnation to the year 5500 and that his work ended at the year 5723 in the 250th Olympiad (AD 221/2). His date for creation corresponded to 22 March 5501 BC (see Ch. 17). A chronicle believed to be that of Hippolytus numbered the 13th year of the emperor Alexander Severus, AD 234, as the year 5738 from Adam.[38] The year 1 in that system would therefore have corresponded to 5504 BC.

Eusebius declined to try to summarize human history beginning with Adam. He did state, to satisfy the curiosity of his reader, that there were 942 years counted backward from the birth of Abraham to the Flood and 2242 years from the Flood to Adam. Since he also said elsewhere that there are 2015 years from Abraham to the Nativity, the total is 5199.[39] Later Greek authors reverted to the 5500 years of Hippolytus and Africanus, but with modifications as to the date of creation. Annianus and Panodorus, contemporaries who worked in Alexandria about AD 400, recalculated the year 1 as beginning at creation on 25 March 5492 BC or proleptically on 1 Thoth = 29 August of 5493 BC, in synchronism with the Alexandrian civil year (see Ch. 16). This 'Alexandrian era' carries with it a Christian era beginning in the year 5501, AD 8/9. The era remains in use in Ethiopia, where the beginning of the year 2000 was observed with great ceremony on 12 September 2007.

The *Chronicon Paschale* uses a year 1 that began during 5510/9 BC (see Ch. 13). Later Byzantine chroniclers follow a system in which the year 1

[37] Ogg 1962; Eusebius, *Chronicle*, p. 212 Helm.
[38] *Liber Generationis*, 130–1; see Ch. 14.
[39] *Eusebius, Chronicle*, pp. 15, 169 Helm.

corresponded to 5509/8 BC. This later date is known as the 'era of Constantinople' or the 'Byzantine era'. In this system, the birth of Christ corresponded to 5506 or 5507, instead of 5500 or 5501 (see Ch. 13).

Jewish tradition attributes a cosmic era corresponding to 3761 BC to Rabbi Hillel II in the fourth century AD. The evidence suggests, however, that this reckoning did not emerge until the seventh or eighth century (see Ch. 5).

9. THE ERA OF THE PASSION

Before the time of Dionysius Exiguus, the closest parallel to a Christian era in the Latin-speaking world was a count of the years since the Passion. Prosper of Aquitania wrote in AD 455 an adaptation and continuation of the *Chronicle* of Jerome. Prosper numbered his years from the Passion, naming the consuls for each year, beginning his number 1 with the year when Fufius Geminus and Rubellius Geminus were consuls at Rome (Mommsen 1892: 410). Victorius of Aquitania followed Prosper's example and numbered the years of his Easter table from the consulship of the two Gemini (Krusch 1938: 27). The consulship of the two Gemini is attested as a date for the Passion as early as Tertullian, a North African convert to Christianity. About AD 200, Tertullian wrote 'An Answer to the Jews', in which he stated (8. 18) that Christ suffered on 25 March in the consulship of Rubellius Geminus and Rufius [*sic*] Geminus. The chronology of Christ is discussed in Ch. 14.

A count of the years since the Passion was on public display in at least one of the churches at Rome. St Bede says that the Roman church of St Mary (Santa Maria Maggiore) inscribed each year on the candles the time elapsed since the Passion. He reports that two of his brethren from the monastery at Jarrow were in Rome in the year 701 of the Incarnation, a 14th indictional year. There they saw and copied down from the candles in St Mary's an inscription that read, 'From the Passion of our Lord Jesus Christ there are 668 years' (*DTR* 47. 61–5).

The statement appears in a passage that shows how old the debate is about the accuracy of the Dionysian Christian era. Bede wants to show that Dionysius' numbering is at least approximately correct, because Christ lived for about 33 years and there is an interval of 33 years between the Dionysian year 701 and the year 668 since the Passion. A 14th indictional year began in September of 700 and would correspond to AD 701 in an Easter table. Bede says that the interval in the inscription corresponds to the year 34 as the date of the Passion. He asserts the traditional calendar date of 25 March and instructs his readers to look up in the Easter table the year that corresponds on the Easter cycle to AD 34. In a strange sentence Bede then concedes that the reader will not in fact find that 25 March was a Friday in that year, nor that Passover occurred near that date.

The candles that Bede's brethren saw were likely Paschal candles inscribed in the Easter season. Scholars have argued about whether Bede was referring to the Easter of 700 or of 701, and they have commented on the irony of Bede's remark about the data for the year 34.[40] Unremarked, however, in recent discussion is Bede's equally puzzling claim that AD 34 was the year of the Passion according to Roman authorities.

The traditional date for the Passion in the Roman church was 25 March in the consulship of the two Gemini AD 29. I know of no evidence that between the time of Prosper and that of Bede the Roman church had changed the traditional date of the Passion. In 1689, Antoine Pagi defended the traditional date in AD 29 against the efforts of Denis Petau and others to move the date into the 30s.[41] In a book published as recently as 1952, Damiano Lazzarotto defended the traditional date in AD 29.

Maintaining the traditional date in AD 29 and a 33-year life span for Jesus requires Lazzarotto to abandon the Dionysian year 1 as the date for the Incarnation. Bede apparently took the opposite course and changed the date of the Passion. It is possible that the officials at the church of St Mary had at some point recalculated the date of the Passion to bring it into conformity with the Dionysian Christian era. Or perhaps Bede's brethren miscopied the inscription they saw, writing *dclxviii* instead of *dclxxiii.* Bede himself may have deliberately falsified the number in his efforts to defend the Dionysian date for the Incarnation.

10. YEARS AD AND BC

The Easter table of Dionysius competed for some time with that of Victorius of Aquitania and with an older method of calculation still in use in some regions of the Latin-speaking world. The Dionysian tables ultimately held sway.[42] Working about 725, Bede extended the tables of Dionysius Exiguus through an entire period of 532 years, covering the years from 532 to 1063.[43] As Bede explained, 532 years is the shortest true Easter cycle in the Julian calendar. This 'great Paschal period', as it is sometimes called, is the arithmetical product of the 19-year lunisolar cycle used by Dionysius Exiguus and the 28-year cycle after

40 Petau 1703, Book 12, ch. 10, p. 234; Jones 1943: 381; Wallis 1999: 337–8.
41 Pagi 1689: xiv; Petau 1703, Book 12, ch. 10, pp. 234–9.
42 Jones 1935; Holford-Strevens 1999: 792–6.
43 *DTR* 65. 1–24; for an English translation of the 532-year table see Wallis 1999: 392–404.

which the days of the week will repeat on the same days of the month in the Julian calendar.

From its use to number the years in an Easter table, the Dionysian era of the Incarnation gradually found its way into both popular and official usage. Some of the manuscripts of Dionysius' table have historical notes in the margin. At the year 626 in a Paris manuscript, there is the note (Krusch 1938: 61): 'Death of Leobald, founder of the monastery at Fleury.' An English document is dated to 6 November of a fourth indictional year, the year 676 from the Incarnation (Ginzel 1906–14: iii, 180). On the continent, Carloman, the uncle of Charlemagne, dated a document to 21 April in the year 742 from the Incarnation (Pagi 1689: v). It was not until the twelfth century that such usage became widespread and not until 1431 that the era of the Incarnation was first used in a Papal document (Pagi 1689: v).

C. W. Jones claimed (1943: 69–70) that 'the first known instance of the employment of the Christian era in historical writing occurs in the chronicle of Victor of Tonenna.' The statement is not entirely accurate. Victor, bishop of Tonenna in North Africa, wrote a continuation of the chronicle of Prosper, covering the period from 444 to 566. He does not in fact use the Christian era in this work, but designates the years by the names of the Roman consuls. At the end, there is a chronological summary: 'from Adam to the Nativity of the Lord 5199 years, from the Nativity of the Lord in the 43rd year of Augustus to the first year of the emperor Justin, successor of Justinian, 567 years, in all 5766.'[44]

Victor follows Eusebius and Jerome in counting 5199 years from Adam to the Nativity. Eusebius and Jerome dated the birth of Christ to the 42nd year of Augustus, not the 43rd (see Ch. 14). In Prosper's note on the Nativity (Mommsen 1892: 407–8), most of the manuscripts date the event to the 44th year of Augustus, with variant readings of 42 or 43. As Mommsen (1894: 181) suggested in his preface to the text,Victor seems to have derived his interval of 567 years not from Prosper or by counting the years elapsed since the 43rd year of Augustus, but from the fact that the year AD 567 was calibrated against a 15th indictional year in the Easter table of Dionysius Exiguus. Victor says that Justinian died in his 40th year of rule and in a 15th indictional year, which would correspond to AD 566/7. The correct date, according to Theophanes (p. 241 de Boor), was 14 November in a 14th indictional year, AD 565, after 38 years, 7 months, 13 days of rule. By coincidence, the indictional year 565/6 would be the year 567 from Christ as counted from Eusebius' date for the Nativity in Olympiad 194.3, 2/1 BC (p. 169 Helm).

It is one thing to count an interval from the Incarnation, another thing entirely to use the era of the Incarnation as a system for historical chronology. Victor of Tonenna did the former. It was Bede who deserves credit for the latter.

44 Victor of Tonenna, p. 55 Hartmann, p. 206 Mommsen.

Bede's *History of the English Church and People*, written in 731, expresses dates by reference to the Dionysian era of the Incarnation. Bede occasionally also expressed dates 'before Christ'. He said (*HE* 1. 2–3) that Julius Caesar was consul with Bibulus in the year 693 from the foundation of the city and the sixtieth before the Incarnation and that the Roman emperor Claudius' invasion of Britain took place in his fourth regnal year, which was the 798th year since the foundation of the city of Rome and the 46th year since Christ. The consulship of Caesar and Bibulus was 59 BC, which is the sixtieth year counted back from AD 1. There is an error in Bede's date for the invasion of Britain. Cassius Dio (60. 21), who wrote a history of Rome from the beginnings to AD 229, dates the campaign to the consulship of Claudius III and Vitellius, which was AD 43 and the third year of Claudius.

Modern historians of antiquity were slow to follow Bede's example. Scaliger characterized the Christian era of Dionysius Exiguus as 'the common era' (*aera vulgaris*)—a usage that appears already in some of the manuscripts of Dionysius' work. This term expresses not only the fact that the era is commonly in use, but also that Dionysius' year 1 differs from other dates for the birth of Christ, both ancient and modern. Scaliger expressed the wish that Dionysius had never invented it.[45]

Scaliger sought to avoid the inconvenience of negative numbers in historical chronology, especially in the absence of a year 0, by devising a system of 'Julian' years counted through a period of 7980 (532 × 15) years from a point corresponding to 1 January 4713 BC. That year is the first date, reckoned back from Scaliger's own time, when the first year of the 15-year Indiction would have coincided with the first year of Bede's 532-year great Paschal period.[46] Thus Scaliger's Julian Period would encompass all of recorded human history up to his own time, with 4851 years left over for future use. The astronomer John Herschel (1849: 633–7) adopted Scaliger's system by proposing a continuous count of Julian days beginning from noon of 1 January 4713 BC. For astronomers, there are 2,914,695 days in a Julian Period. These 'Julian days' are still widely used for astronomical calculations, and they have recently been adopted for date-functions in computer programming (Meeus 1998: 59–66).

James Ussher (1658: iv), bishop of Armagh and Vice-Chancellor of Trinity College Dublin, followed the lead of early Christian scholars in arguing for a system reckoned from the creation of the world, which he recalculated at a date corresponding to Sunday, 23 October, in the year 710 of the Julian period, or 4004 BC. Both the Julian Period and the Ussherian dates enjoyed some currency among historians during the early modern period. In his

[45] Scaliger 1629, Book 6, pp. 541–51, see 548: *quod utinam numquam in mentem venisset, aut illi hoc imperandi, aut nobis parendi.*

[46] Scaliger 1629, introduction to Book 5.

Rationarium temporum (1633: book 1, cap. 4) Petau not only embraced the Dionysian Christian era, but also was the first modern scholar to advocate its use for historical chronology of the period *ante natalem Christi*. Petau's suggestion lay all but forgotten, however, until Franz Rühl (1906) reminded scholars of it.

As late as the 19th century, it remained a standard practice for historians of Graeco-Roman antiquity to date events by reference to the numbered Olympiads or to the traditional date for the foundation of Rome. A noteworthy example is the history of Rome by Barthold Niebuhr, published in 1812. Niebuhr eschewed the Christian era as 'notoriously misplaced' and opined that 'such eras as reckon backward, or are necessarily dependent on a supposition ascertained to be utterly wrong, are positively bad'.[47] Theodor Mommsen, in his history of the Roman Republic, first published in 1854, uses years from the foundation of the City in the text, with the equivalent years BC noted only in the margin.

As Rühl (1897: 204) pointed out, English scholars were less reluctant to use the Dionsyian common era. Sir Isaac Newton used years BC in his *Chronology of Ancient Kingdoms Amended* (1728). In his *Fasti Hellenici*, Henry Clinton (1851: xiv) conceded that 'No history of Rome should be written without the years of Rome, nor any history of Greece without the Olympiads.' Clinton rightly argued, however, that these eras 'convey no information' to the modern reader until 'resolved' into 'the Vulgar Christian Era.'

To facilitate calculations, astronomical tables express dates before AD 1 as a negative number, with the year 1 BC serving as a notional year zero. Thus the solar eclipse that the early Greek scientist Thales of Miletus is said to have predicted appears in the tables as 28 May –584, which is equivalent to 28 May 585 BC.[48] The frequent complaint, as in the notice of the Royal Observatory, that Dionysius Exiguus was unfamiliar with the concept of zero has no basis in the facts. The Easter table of Dionysius begins with a new moon on the day of its conjunction with the sun. In some tables, such a new moon was designated as the 30th day of the lunar cycle. Dionysius, however, counts it as zero (*nulla*). The lack of a symbol for 0 in Roman numerals and in the Greek alphabetical system of numbering does not mean that the ancients had no notion of the concept.

The absence of a 'year 0' in a system for historical chronology has nothing to do with the lack of a symbol for it prior to the introduction of Arabic numerals. Computer programmers number a series from 0, but the notion of a year 0 in a system of historical chronology is absurd. Any numbered chronological system

[47] Niebuhr 1812; translation (1828) i. 222.
[48] Herodotus 1.74–5; Espenak and Meeus 2006: #03379.

has to be begin somewhere, and that year is necessarily the first year of the count. The previous year is just as necessarily the first year before the count.

11. THE COMMON ERA

The use of the term 'Common era' in historical writing and of the abbreviations 'CE' and 'BCE' has come only recently into general practice, primarily among American academics. This usage recognizes that the Dionysian Christian era is indeed commonly in use, but avoids the specifically Christian connotation of designating years as 'of the Lord' or 'before Christ'. The earliest reference I have been able to find to the abbreviations CE and BCE arises from within the American Jewish community in the title of a book published in 1855 by the prominent New York Rabbi Morris J. Raphall, *Post-Biblical History of the Jews: From the Close of the Old Testament, about the Year 420* BCE, *till the Destruction of the Second Temple in the Year 70* CE (Philadelphia, 1855). In a large electronic database of academic journals (www.jstor.org), the abbreviation BCE does not appear outside of Judaic studies and closely related fields until 1962 and not again until 1970. The usage becomes frequent only in the 1990s. The convention has since become a scholarly standard, at least in the United States. The *American Journal of Philology* now asks its contributors to use the abbreviations CE and BCE.[49]

I use the traditional abbreviations throughout this study, with the Latin AD (*anno domini*) preceding the numeral and the English BC 'before Christ' following the numeral.

12. CALENDARS

i. The Roman Calendar

Regulation of the calendar at Rome was one of the duties of the Pontifex Maximus, an office with life-time tenure to which Julius Caesar was elected in 63 BC.[50] By Caesar's time, the calendar had become badly out of synchronism with the seasons. After Caesar had emerged as Dictator following the civil

[49] http://www.press.jhu.edu/journals/american_journal_of_philology/guidelines.html, accessed 21 Oct. 2005.

[50] Suetonius, *Julius Caesar* 13.

wars of the 40s, but acting in his role as Pontifex Maximus, Caesar reformed the Roman calendar to make it conform to a solar year of 365¼ days. In order to recalibrate the calendar with effect from January of 45 BC, he found it necessary to intercalate an extra 67 days between November and December of 46 BC.[51]

No ancient source explains how Caesar determined that precisely 67 days should be intercalated. The traditional date of the vernal equinox in the Roman calendar was 25 March (Pliny 18. 246), but the equinox occurred on 23 March in 45 BC. Ideler (1825–6: ii. 122–3) therefore suggested that the objective of the reform was partly to bring the winter solstice at least approximately back to its traditional date on 25 December, partly to make 1 January of 45 BC concide with a new moon. Ideler calculated that the winter solstice occurred on 24 December in 46 BC.

The modern western calendar is identical with this Julian calendar in the names and lengths of the months and in defining the year as beginning on 1 January—except that the months of Quinctilis and Sextilis were subsequently renamed in honour of Julius Caesar and of Augustus. The Romans did not, however, number the days of the months continuously, as we do, but by reference to three points in the month—the Kalends, the Nones, and the Ides. The Kalends is always the first day of the month. The Nones is the fifth day of the month and the Ides the 13th day, except that in March, May, July, and October, the Nones was the seventh day of the month and the Ides the fifteenth. The Romans numbered the days by counting backwards from these points, with the reference point itself counted as 1. Thus 25 March, which was the traditional Roman date both of the vernal equinox and of the Passion, was the eighth day before the Kalends of April.

Under Caesar's reform, the various months received the number of days that they still retain. Every fourth year, an additional day was added in February. Before the time of Caesar, the Romans used a calendar of twelve lunar months consisting of 355 days—a variation on the standard lunar calendar of 354 days.[52] The calendar was supposed to be adjusted to restore a correspondence with the seasons of the solar year through the intercalation of an additional month every other year. This was accomplished by the insertion after the 23rd or 24th day of February of a 27-day month named 'intercalary'.[53] The choice of February may be a relic of a time when March was the first month of the year. The names of September, October, November,

[51] Suetonius, *Julius Caesar* 40; Censorinus 20. 8–11; Macrobius 1. 14. 6–2; Hannah 2005: 112–14.

[52] Hannah 2005: 98–102, 106–8.

[53] Hannah 2005: 106–10; the sources vary as to the details.

and December mean literally the 7th, 8th, 9th, and 10th month, thus reflecting a calendar beginning with March.

The Julian calendar retained the custom of intercalating after 23 February—adding now not a month every couple of years, but a day every fourth year. In the Roman system of nomenclature, the 24th day of February was called the sixth day before the Kalends of March. So as to make minimal disturbance to this system, the additional day was designated as a second 'sixth day before the Kalends of March'. Hence, a leap-day is a 'bissextile day', the year is a 'bissextile year', and the four-year period is a 'bissextile' cycle. In the system of counting backwards from the Kalends, the additional day was the second sixth day before the Kalends and the previous day was the sixth day before the Kalends.

In the unsettled times that followed upon Caesar's assassination in 44 BC, the leap-year intercalations were not done correctly. In 9 BC, the emperor Augustus issued orders to rectify the errors by omitting intercalations for the next 12 years.[54] Leap years resumed in AD 8, and from that date until the Gregorian reform a leap-day was inserted every fourth year in the years that correspond to multiples of 4 in our system of numbering AD. In this study, whenever I calculate a date prior to AD 8—e.g. Sunday, 22 March 5001 BC, as a date for creation—I do so on the basis of a theoretical (proleptic) Julian calendar retrojected into the past.

ii. The Egyptian and Alexandrian Calendars

The Egyptian calendar consisted of twelve months of 30 days each, beginning with the month of Thoth and ending with the month of Mesore. At the end of Mesore, five additional days were added to the calendar to make a total of 365 days in a year. In Greek, the word for 'additional' is 'epagomenal', and modern scholars continue to use this term in reference to the 'epagomenal' days. Before Augustus introduced the Julian calendar, the Egyptians permitted the 1st day of Thoth to move with respect to the seasons. As Censorinus informs us (18. 10), it would take 1460 years (365×4) for this 'mobile' calendar year to return to its same place in the agricultural year. Ancient writers give several names for this cycle of 1460 years. According to Censorinus, in the first year of this 1460-year period the first day of Thoth would coincide with the rising of the Dog star. Censorinus refers to it as the 'Dog' or 'Great' period. The Dog star (Alpha Canis Majoris) is known as 'Sirius' to the Greeks, 'Sothis' to the Egyptians. Clement of Alexandria (*Stromata* 1. 21. 136) uses the phrase 'Sothic Period', and that is the term most commonly in use among modern scholars.

[54] Macrobius 1. 14. 13–15; Hannah 2005: 118–20.

After the conquest of Egypt in 30 BC, Augustus introduced the Julian calendar. The first day of Thoth was given a fixed point, corresponding to 29 August in the Roman calendar. That is the date given by the *Hemerologium* mentioned above, and it can be confirmed from many other sources. Every fourth year, a sixth epagomenal day was added to the calendar before the first day of Thoth. The intercalation took place six months before the intercalation at Rome. Hence, in leap years 1 Thoth would correspond to 30 August, and correspondences between the two calendars would have this additional one-day differential until the end of February. For purposes of calendrical calculation, this sixth epagomenal day was sometimes treated as belonging to the new year about to begin, rather than to the old year just ending. Therefore, it was the new year that was actually designated as a leap year. The fourth-century astronomer Theon of Alexandria designates leap years in this way in his *Fasti Consulares* (Mommsen 1898: 375–81). Hence a Roman leap year began in the middle of an Alexandrian leap year. In the Ethiopic Easter tables, which use the Alexandrian calendar, the epagomenal days are also sometimes associated with the following year (Neugebauer 1979: 113–14). The Augustan reform at Alexandria will be discussed further in Ch. 16.

The Egyptian months that one encounters in the sources most frequently with respect to Easter calculations are the springtime months of Phamenoth and Pharmouthi. In the fixed Alexandrian calendar, 1 Phamenoth corresponded to 25 February (26 February in a leap year) and 1 Pharmouthi to 27 March.

Even after the introduction of the Julian calendar, the Alexandrian astronomers continued for the sake of consistency to express dates in the old system. Ptolemy (*Almagest* 3. 1) dated his observation of the vernal equinox in the year corresponding to AD 140 to the 7th day of Pachon. In the fixed calendar, 7 Pachon corresponded to 2 May. By AD 140, 41 days of difference had accumulated between the fixed and mobile calendars, so that 7 Pachon in the mobile Egyptian calendar was 22 March in the Roman calendar. Theon's *Fasti Consulares* included a column showing for each year the number of days of difference.

iii. The Macedonian Calendar

The conquests of Alexander the Great and his successors brought the Macedonian calendar into the Near East. The new year began approximately at the time of the autumnal equinox, but local practice varied. The standard calendar to which the sources cited in this study most often refer is that of Antioch in Syria, which scholars sometimes call the 'Syro-Macedonian calendar'.

The *Hemerologium* tells us that at Antioch the year began on the first day of the Macedonian month Hyperberetaios, 1 October. At Ephesus the year began on the first day of the Macedonian month of Dios on 24 September. In Constantinople, the new year began on the first day of the Macedonian month of Gorpiaios, 1 September.

iv. The Babylonian and Jewish Calendars

The Jews adopted the Babylonian calendar during the period of the Exile, if not before. It was a lunar calendar of 354 days beginning with the month of Nisan in the springtime. Some of its major features are discussed in Ch. 3.

v. The Gregorian Calendar

The calendar now commonly used as an international standard is a modified form of the Julian calendar. The Julian year of 365¼ days exceeds the average length of the true solar year. Therefore the date and time of the vernal equinox recedes slightly each year with respect to the Julian calendar. Astronomers of the renaissance period estimated the length of the year to be 365 days, 5 h, 49 m, 16 s, or 365.2425463.[55] By that calculation, the vernal equinox recedes with respect to the calendar by about one day every 134 years. Acting on a recommendation of the Council of Trent, Pope Gregory XIII on 24 February 1582 promulgated a new calendar to correct the accrued error.[56]

Between the time of Julius Caesar and Gregory XIII the differential between the Julian year of 365.25 days and the tropical year of 365.2425463 should have accumulated to 12 days. Gregory decided, however, to norm the calendar by reference to the conventional date of the vernal equinox on 21 March. As we shall see (Ch. 8), that was the date adopted in the Easter calculations of the early church. It was astronomically correct in the Julian calendar in the middle of the third-century AD. By the middle of the sixteenth century, the true date of the vernal equinox had receded to 11 March in the Julian calendar.

Gregory therefore decreed that ten days should be omitted from the calendar in October of 1582, such that the day after 4 October would be designated as 15 October. To prevent further error from accruing, Gregory

[55] Meeus and Savoie 1992.

[56] Papal Bull, *Inter gravissimas*, Latin text with English and French translations available at the website of the International Organization for Standardization, http://isotc.iso.org/livelink/livelink/fetch/2000/2122/138351/138352/1311683/4020763/2015225/8601RevN005_Inter_Gravissimas.pdf?nodeid=2179035&vernum=1, accessed 3 Feb 2008.

adopted a new leap-year rule. Henceforward, century-years would not be leap years unless divisible by 400. Thus, the years 1600 and 2000 were leap years, but 1700, 1800, and 1900 were not.

Most Catholic countries adopted the Gregorian calendar on or shortly after its effective date on 15 October 1582. Countries that were predominantly Protestant or Eastern Orthodox resisted anything of Papal provenance. Most Protestant regions on the continent had adopted an 'Improved Calendar' by the beginning of the eighteenth century, but not necessarily the Gregorian Easter tables. Britain finally adopted the 'New Style' of calendar in 1752, but the Church of England developed its own methods for determining the date of Easter, which produced the same results as the Gregorian tables. The Russians adopted the new calendar after the revolution of 1917.[57] Greece adopted a 'New Calendar' in 1923, but on the basis of a slightly different leap-year rule that produced agreement with the Gregorian calendar without implying the acceptance of a Papal decree.[58] Some countries and churches still use the Julian calendar, which now runs 13 days ahead of the Gregorian calendar. Thus, in Ethiopia, the new year begins on a date equivalent to 1 Thoth = 29 August in the old Julian calendar of Alexandria. That date corresponds to 11 or 12 September in the Gregorian calendar.

The Gregorian calendar produces a solar year of 365.2425 days. The now commonly accepted value for the mean tropical year is 365.24219, as calculated by Simon Newcomb in 1895.[59] The 'mean tropical year' is the average of the time elapsed from one year to the next between each of the four equinoctial and solstitial points. The intervals are not constant, however, and the average is presently decreasing.[60] For a set of complex astronomical reasons, the average date of the vernal equinox has now receded to 20 March.[61]

57 On the adoption of the Gregorian calendar, see Holford-Strevens 1999: 683–8.

58 Milanković 1924.

59 Newcomb 1895.

60 Meeus and Savoie 1992.

61 United States Naval Observatory, http://aa.usno.navy.mil/data/docs/EarthSeasons.php, accessed 3 Feb. 2008.

3

Easter and the Passover Moon

The Christian era of Dionysius Exiguus originated as a system for numbering the years in a 95-year table of dates for Easter that he compiled as a continuation of an Alexandrian model. A list of dates is necessary, because Easter is a movable feast: it is observed each year on a Sunday, but the exact date depends on the phases of the moon. The general rule is that Easter is the first Sunday after the first full moon that occurs on or after the vernal equinox. Even in the twenty-first century, the date is determined not through astronomical calculations of the equinox and the phases of the moon, but on the basis of a calendrical convention for the date of the equinox and mathematical formulae for the phases of the moon, both of which derive from the third century AD. The calculations have been modified since that time, but the fundamentals remain the same.

1. EASTER AND PASSOVER

'Easter' is a Germanic word whose root refers literally to the rising of the sun in the eastern horizon. St Bede (*DTR* 15) informs us that in the old English language the month corresponding to April was called 'Eosturmonath'. He says that the English called the month by that name after a goddess named 'Eostre', in whose honour they celebrated festivals in that month. In Slavic, Easter is referred to either as the 'Great Night' (Polish *Wielkanoc*) or as the 'Great Day' (Bulgarian *Velikden*), perpetuating what was originally a New Year's festival. The Romance languages use a more properly Biblical term (French *Pâques*, Spanish *Pascua*) derived from the Greek and Latin transliteration *Pascha* of an originally Hebrew word.

The original meaning of the Hebrew word *Pesach* is unknown. The word is similar to that for 'pass over'. The Hebrew Bible (Exod. 12: 1–14) therefore explains *Pesach* as a commemoration of the Exodus from Egypt and specifically of the time that the Lord spared the first-born of the Hebrews by 'passing over' their houses when he smote the Egyptians (Propp 1999: 398–9). The Bible

(Exod. 12: 18; Lev. 23: 5) calls for a seven-day observance beginning on the 14th day of the first month of the year, when the barley is ripening.[1] The observance includes the ritual slaying of lambs, the flesh of which is to be roasted and eaten along with unleavened bread and bitter herbs (Exod. 12: 6–8).

The Christian Paschal festival is an annual observance of the crucifixion and resurrection of Jesus. Its connection with Passover derives from the Gospel narratives, all four of which agree (Matt. 26: 1, Mark 14: 1, Luke 22: 1, John 11: 55) that Jesus was arrested and executed when he went to Jerusalem for the annual observance of the Passover. These narratives also agree that Jesus was crucified on a Friday and rose from the dead on a Sunday (Mark 15: 42, 16: 1–2; John 19: 14, 20: 1). In the Gospel according to John, John the Baptist hails Jesus as 'Lamb of God'. St Paul refers to Christ as the Paschal lamb and the crucifixion as the true Passover sacrifice (1 Cor. 5: 7). An annual observance of the Passion should therefore take place about the time that the Bible prescribes for Passover—the 14th day of the first Hebrew month.

2. THE JEWISH LUNAR CALENDAR

The fourteenth day of the first month in the Hebrew calendar does not correspond to a fixed date in the Julian calendar. Like most ancient peoples, the Israelites and their Judaean descendants used a lunar calendar.[2] Since the barley must be ripe, the 14th day of the first month is a reference to the full moon of springtime.

The average length of a lunation is about 29½ days. Geminus (8. 3), a Greek astronomer and mathematician of the first century BC, informs us that a standard lunar calendar consists of 12 lunations, alternating between 'full' months of 30 days and 'hollow' months of 29 days, for a total of 354 days in a lunar year. Since the lunar calendar falls short of the earth's solar circuit by about 11¼ days, the phases of the moon recede by about 11 days each year with respect to the Julian calendar. Thus there was a full moon at the longitude of Greenwich on 25 March 2005, but on 14 March 2006, and 3 March 2007.[3]

In ancient cultures, it was usually the religious authorities who regulated the calendar. They added a thirteenth month at approximately three-year intervals

[1] On the barley, see Propp 1999: 421–2, 429–30.

[2] On the Jewish calendar, see Ginzel 1906–14: ii, 1–115; Finegan 1964: 33–57, 1998: 29–49; Stern 2001.

[3] http://aa.usno.navy.mil/data/docs/MoonPhase.php, accessed 12 Feb. 2008.

in order to maintain a relationship between the months and the seasons. For Jewish authorities, it was necessary to maintain the connection between the first month and the ripening of the grain. Geminus calls such a month 'embolismic' (Greek for 'thrown in'), and that technical terminology remains in use. In Latin terminology, such additions to the calendar are called 'intercalations'. Thus, an 'embolismic' month is said to have been 'intercalated' into the calendar.

In earlier times, intercalations were managed empirically. That is, the relevant authorities would determine by observation when a new month began and when it was appropriate to insert an intercalary month. In New Testament times and at least until the fourth century, the religious authorities in Jewish communities continued to determine the beginning of a month by actual observation of the first visible crescent of the new moon (Stern 2001: 47–85). The Babylonian Talmud has a discussion of intercalation in the *Tractate Sanhedrin* (10b–12b), with rules about the circumstances under which an intercalary month should or should not be added. There we learn that a committee of three must be appointed for the purpose, that the intercalation consists of 30 days, and that the extra month is designated as a second month of Adar (the last month in the calendar).

An inscription discovered in 1908 at Gezer (about 20 miles north-west of Jerusalem), dated to the tenth century BC, suggests that the earliest calendar of the Israelites began in the autumn (Albright 1943). By the time that the rules set forth in the Book of Exodus were formulated, the first month of the year began in the springtime. The earliest explicit reference, outside the Pentateuch (first five books of the Bible), to the numbering of the months beginning with 1 in the springtime is in the Book of Jeremiah (36: 9–22), narrating events during the fifth year of King Jehoiakim (*c.*604 BC). It was in the ninth month of that year that Baruch read from a scroll dictated to him by the prophet Jeremiah, and the king was in his winter house when he sent for the scroll. If the ninth month was in the winter, the first month was in the spring.

In Hebrew, the name of the first month was 'Abib' (Exod 23: 15, Deut. 16: 1), a word that literally means 'ripe grain'. The word appears at Exod. 13: 4 in a phrase usually translated, 'You are to go forth in the month of Abib.' A more literal rendering would be, 'Today you are going forth in the month of New Grain.'[4] The Biblical texts more often number the months than name them—as for example in the calendar of festivals in Leviticus 23. By the middle of the fifth century BC, the community had adopted not only a version of the Babylonian calendar beginning in the springtime, but also the Babylonian names for the months. The Book of Nehemiah (2: 1) reports that it was during the month of Nisan in the twentieth year of the Persian King Artaxerxes (445 BC) that

[4] So Propp 1998: 357, with note p. 421.

Nehemiah departed from Susa for Jerusalem. 'Nisan' is the first month of the Babylonian calendar. The narrative states that it was on the 25th day of the month of 'Elul' (named but not numbered, Neh. 6: 15) that the walls of Jerusalem were completed, and that the seventh month (numbered but not named, Neh 7: 73–8: 1) had begun when the people gathered to hear Ezra read from the Book of the Law. Dionysius Exiguus and other Christian writers refer to the month during which Passover must fall as 'Nisan', not 'Abib'.

In addition to the Passover festival in the first month, the Bible (Lev. 23: 23–43) also prescribes a series of observances in the seventh month, named Tishri in the later calendar. The first day of the seventh month is a day of rest, with sounding of the shofar and a holy convocation. The tenth of the month is a day of atonement (Yom Kippur), and on the fifteenth day begins the seven-day festival of booths (Tabernacles, Succoth).

By Rabbinical times, the first day of Tishri had come to be recognized as the beginning of a new year. In the Talmud, the rabbis taught that Nisan is the beginning of the count of the months for religious purposes, but Tishri, the seventh month, is the beginning of the year for chronological purposes (*Tractate Rosh Hashanah* 1a). Hence the Jewish community observes Yom Kippur on the tenth day of the seventh month, as prescribed in Leviticus 23: 26, shortly after observing New Year's Day (Rosh Hashanah) on the first day of that same seventh month. According to the Talmud, Rabbi Yehoshua taught that God created the world in the month of Nisan, and this was the view that prevailed among Christian authors. Rabbi Eleazar, however, held that the world was created in Tishri; and it is his view that ultimately prevailed in Judaism (*Tractate Rosh Hashanah* 8a). Thus Rosh Hashanah is not merely 'New Year's Day', but a commemoration of the Biblical story of creation.

The origin of this counting of the years from the first of Tishri is obscure. The Book of Nehemiah counts both Chislev (1: 1), the ninth month, and the following Nisan (2: 1) as belonging to the 20th year of Artaxerxes. These references and the fact that a covenantal convocation was held in the month of Tishri (Neh. 8: 1, 9: 1, 9: 38) suggest that the community had adopted a civil calendar beginning in the autumn by the time of the Persian period. Some evidence for such a calendar can be found already for the period before the exile. The Book of Kings dates both the audit of accounts (2 Kgs. 22: 3–4) and the observance some time later of the Passover (2 Kgs. 23: 21–3) to the same 18th year of King Josiah. Therefore the 18th year of Josiah must have begun before the month of Nisan. The Book of Exodus prescribes an autumnal festival for the wheat harvest at the 'going out' (23: 16) or 'turning' (34: 22) of the year. William Propp (1999: 383–92) has speculated that there was a solar new year in the autumn and a lunar new year in the spring, with days counted from sunrise in the solar calendar and from moonrise in the lunar calendar.

3. PASSOVER AND THE DATE OF THE PASSION

The relationship of the Passion to the Passover and therefore the appropriate point in the lunar cycle for observing Easter is not a simple matter. Neither the Hebrew texts nor the New Testament narratives are all fully consistent with one another.

One issue is the counting of days. The beginning of a complete period of night and day might be reckoned at sunrise, at noon, at sunset (or moonrise), or at midnight. Pliny the Elder (2. 188), writing in the mid-first century AD, says that the Babylonians counted the day from sunrise to sunrise, the Athenians the period between two sunsets, the Umbrians (an Italian people) from midday, and ordinary people everywhere from dawn to dark. The Romans, he says, and the Egyptian astronomers count the period from midnight to midnight. The Alexandrian astronomer Claudius Ptolemy (*Almagest* 3. 1) gives double dates for observations between midnight and sunrise. Thus the official day in Egypt seems to have begun at dawn, the astronomical day at midnight.

The Book of Exodus prescribes (12: 3–8) that on the 10th day of the first month, every household is to select a lamb. On the 14th day 'between the evenings' they shall kill the lamb, and they shall eat the flesh that night, roasted, with unleavened bread and bitter herbs. The phrase 'between the evenings' in the Hebrew text is most likely a reference to the twilight between sunset and darkness (Propp 1999: 390–1). It is translated as 'dusk' in the Revised Standard Version. Here and in several other passages of the Hebrew Bible, the day can be understood in Pliny's ordinary-language sense as beginning in the morning. At Gen. 19: 34, for example, one of Lot's daughters, after lying at night with her father, 'on the next day' encourages her sister to do the same.

In the Book of Numbers (9: 5), we are told that Moses and the people observed the Passover in the first month of the second year on the fourteenth day 'in the evening'. The Book of Leviticus (23: 5–6) says the Lord's Passover is on the 14th day of the month 'between the evenings' and on the 15th day of the same month is the feast of unleavened bread. In Numbers, the day seems to begin at sunrise. In the passage from Leviticus, the day begins at sunset—the view that prevailed in later Rabbinical Judaism.

The apocryphal Book of Jubilees, written in the first or second century BC, extant only in Ethiopic and in fragments both Hebrew and Greek, prescribes

(49. 1) that the people shall sacrifice the lamb on the 14th day of the first month, before it is evening, and that they should eat of it after sunset on the 15th day of the month. The Jewish historian Flavius Josephus, writing in the 70s AD, says (*Jewish War* 6. 423) that the Passover Lamb was sacrificed in the afternoon. It appears to have been the practice, therefore, at least in the time of Jesus, that the lamb was sacrificed on the 14th day of the month, a few hours before the 15th day began that evening.

New Testament writers generally use the word 'day' in the ordinary sense of the period of daylight between dawn and dusk. In the Parable of the Labourers (Matt. 20: 1–15), Jesus speaks of the owner of the vineyard as hiring labourers early in the morning and again at the third, sixth, ninth, and eleventh hours. The Gospel according to Mark (15: 33), followed here as in other such narrative details by Matthew and Luke, says that Jesus died at the ninth hour of the day. One of the few references to a day in a more calendrical sense occurs in Mark's narrative (14. 12–25), where Jesus is said to have observed a Passover meal with his disciples on the first day of unleavened bread, the same day when the Passover lamb is sacrificed. The slaying of the lamb in the afternoon and the feast of unleavened bread in the evening can occur on the same 'day' only if the day began at sunrise. Similarly, Mark (15: 42) refers to the evening after the crucifixion as the day before the Sabbath. Later Christian teaching generally followed the New Testament understanding of a day. In the prologue of his Easter table, Theophilus—bishop of Alexandria between 385 and 412—said that Jesus was betrayed on the 14th day of the month and crucified on the 15th (Krusch 1880: 225). Since the betrayal took place in the evening after the Last Supper (Mark 14: 17, 14: 43), Theophilus treated the 15th day as beginning the following morning.

A more serious problem is the disagreement between the Gospel of Mark (and its parallels in Matthew and Luke) and the Gospel of John as to whether the Passion took place before or after the beginning of Passover.[5] They agree that it was on a Friday, the day of preparation for the Sabbath, that Jesus was crucified (Mark 15: 42; John 19: 31). Mark says that Jesus shared a Passover meal with his disciples on the eve of his death. Since the lamb was slain on the 14th day before evening and the Passover meal was eaten in the evening of that day, Mark's account implies that the crucifixion took place on the 15th day of the month. John says (18: 28) that the Jews did not enter the Roman praetorium on the day of the crucifixion, lest doing so prevent them from eating the Passover, and (19: 14) that it was the day of preparation for the Passover, as well as preparation for the Sabbath (19: 31). John's account implies that the crucifixion took place on the fourteenth day of the month just before a Passover meal would have been

[5] For fuller discussion, see Meier 1991: 388–400; Finegan 1998: 354–7.

taken in the evening. Although the Johannine narrative does not explicitly make the connection, this account also implies that the crucifixion of the Lamb of God 'at the sixth hour' (John 19: 14) coincided with the sacrifice of the Passover lamb in the temple.

Julius Africanus, writing in the early third century, seems to have adopted a version of John's account. George Syncellus preserves (391.11) a long quotation from Africanus 'On the Passion', which includes the statements that the Hebrews observe the Passover on the 14th day of the moon and that the Passion occurred on the day before the Passover (see Ch. 17).

By the end of the fourth century, Theophilus and Christian orthodoxy after him had accepted the implications of Mark and the other synoptic Gospels: Jesus was betrayed on the 14th day, suffered on the 15th day, and rose from the dead on the 17th day of the moon. St Bede (*DTR* 61) quotes with approval the relevant portion of the prologue of Theophilus. Whether Theophilus was correct in his understanding of the synoptic Gospels and whether Jesus was in fact crucified on the 15th day of the moon are a separate matter. If Pilate had tried and executed Jesus on the 15th day of Nisan, he would have been profaning a Jewish holy day of rest. For this and other reasons, many modern scholars prefer the Johannine account.[6]

4. EARLY EASTER OBSERVANCES

The annual observance of Easter on a Sunday was not the only practice in earliest Christianity.[7] The churches of Asia Minor (the Anatolian peninsula of western Turkey) were the oldest Christian communities outside of Syria and Palestine. Epiphanius, bishop of Salamis in Cyprus, who wrote a *Panarion*, or 'medicine chest' of remedies against heresy toward the end of the fourth century, informs his readers that among the Christians of Asia Minor, Easter was a unitary festival, commemorating the Passion and the Resurrection together on the same day. The Cappadocians held the Paschal observance on one and the same day—the 25th day of March—regardless of either the day of the week or the age of the moon. Elsewhere in Asia, he says, Christians always observed the holy day on the 14th day of the moon, at the same time as the Jewish Passover, regardless of either the day of the week or the day of the month in the local calendar.[8] As Thomas J. Talley (2003) has pointed out, the

[6] Meier 1991: 398–401; Finegan 1998: 357–8.
[7] For a more comprehensive discussion, see Beckwith 1996: 51–70.
[8] Epiphanius, *Panarion* 50. 1; ii. 244–5 Holl, ii. 23–4 Williams.

Cappodocian observance also derives from the association of the Passion with the fourteenth day of the month.[9] March 25th corresponds to the 14th day of Teireix in the Cappadocian calendar. The names of the Cappadocian months are Zoroastrian, adopted during the period of Persian rule between the sixth and the fourth century BC (Samuel 1972: 171–7). Another variant appears in the date of 6 April that Sozomen (7. 18) attributes to the Montanists. He says they always observe Easter on the first Sunday on or after 6 April. That date corresponds to 14 Artemision in the calendar of those Asian cities that adopted 23 September as the beginning of the civil year (Talley 2003: 152). The Montanists were followers of Montanus, an ecstatic prophet of Phrygia who lived in the 160s (Barnes 1970).

Epiphanius and Sozomen refer to people who observe Pascha on the 14th day of the month as 'Quartodecimans' (14th-ers), and historians have adopted that term. These Greek-speaking Christians apparently thought of the observance as commemorating especially the day of the Passion. They understood the word 'Pascha' as being related to the Greek word for 'suffer' (*paschein*). Melito, bishop of the Asian city of Sardis during the 180s, expresses that idea explicitly (*On Pascha* 46).

The Resurrection of Jesus was commemorated every week (not just every year) on Sunday. Justin the Martyr, a Palestinian convert who taught first at Ephesus and then moved to Rome, addressed a defence of Christianity to the emperor Antoninus Pius in the middle of the second century. Justin informs the emperor that Christians gather each week on the day called Sunday to celebrate the Eucharist, because it was on a Sunday that God created the world and a Sunday when Jesus rose from the dead (*First Apology* 67).

An annual observance of the Resurrection on a special Sunday arose at Rome, Jerusalem, Alexandria, and elsewhere by the end of the second century and led to conflict with the Christians of Asia. Writing about events during the time of the emperor Commodus (180–92), Eusebius of Caesarea says (*HE* 5. 23) that the churches of Asia thought that 'in accordance with ancient custom' they ought to observe the 14th day of the lunar month as the beginning of the Paschal festival and break their fast on that day, regardless of the day of the week. Everywhere else in the Roman world, Eusebius says, Christians thought it improper to break the fast on any day other than Sunday, the day of the Resurrection. So the bishops of the time held a number of conferences on the subject and unanimously agreed that never on any other day than the Lord's Day should the mystery of the Resurrection be celebrated and the fast broken. This agreement was communicated by letters, Eusebius says, mentioning in particular letters sent from a synod at Caesarea in

[9] I owe the reference to Leofranc Holford-Strevens.

Palestine under the presidency of its bishop Theophilus, letters from a conference at Rome when Victor was the bishop, and letters from bishops in the Black Sea region, Gaul, and Corinth.

Many of the Asian bishops, Eusebius continues (*HE* 5. 24), resisted any departure from their ancient custom. Eusebius quotes extensively from a letter of Polycrates of Ephesus addressed to Victor and the Roman church. Polycrates appeals to an ancient tradition, beginning with Philip the Apostle in Hierapolis and continuing through to Polycarp of Smyrna and Melito of Sardis, all of whom, he says, 'observed the 14th day of the month as the beginning of the Paschal festival'. Victor responded with letters of his own in which he declared the churches of Asia out of communion with the rest of the Christian world. Several bishops intervened to urge Victor to a more pacific stance on the issue. Among them was Irenaeus, bishop of Lyons in Gaul. Eusebius quotes from a letter of Irenaeus, in which the Gallic bishop pointed out, among other things, that when Polycarp of Smyrna visited Rome he and the Roman bishop Anicetus respected each other's Paschal traditions. In his chronicle (p. 203 Helm), Eusebius dated that meeting about 156.

Irenaeus was himself originally from Asia. In another letter from which Eusebius quotes (*HE* 5. 20), Irenaeus refers to his boyhood in 'Lower Asia' in the time of Polycarp. Although Irenaeus had himself adopted the Roman practice of observing Easter on a Sunday, he was sympathetic to the Asian tradition.

5. 25 MARCH AND THE DATE OF THE FIRST EASTER

The Cappadocian observance of Pascha on a date corresponding to 25 March in the Roman calendar is a variant of Quartodecimanism, rather than a witness to an early tradition associating 25 March with the events of the Passion. The so-called 'Acts of the Council of Caesarea' (Krusch 1880: 303–10) include a statement that 'the inhabitants of Gaul always celebrate Easter on whatever day is the eighth before the Kalends of April (25 March), when the Resurrection is said to have taken place'. The document is a forgery, as Krusch has shown, and the tradition of a Gallic observance on 25 March may itself be fraudulent.

Whatever the situation in Cappadocia and Gaul, 25 March in the consulship of the two Gemini, AD 29, as the date of the Passion was firmly established in the Latin church by the early third century. Latin writers from Tertullian to Augustine and Bede attest to that tradition.[10] The date also appears in the earliest

[10] Tertullian, *Adversus Iudaeos* 8; Augustine, *City of God*, 18. 54; Bede *DTR* 47.

extant Roman Easter table, that attributed to Hippolytus, constructed in the 220s and written in Greek (*PG* 10. 875; see Ch. 7).

In the Alexandrian and later the Byzantine church, 25 March became the date of the Resurrection, rather than of the Passion. The *Chronicon Paschale* (415: 13, 422: 20) dates the Passion to 23 March of a 4th indictional year, in the consular year before that of Arruntius and Ahenobarbus. Both the indictional number and the Roman consular year correspond to AD 31, in which year 25 March was a Sunday. The earliest evidence for that date is a fragment from the chronicle of Julius Africanus, completed in AD 221/2, according to which Africanus dated the Passion to the 2nd year of the 202nd Olympiad, AD 30/1 (Eusebius, *DE* 8. 2. 53). Since the Olympiad year began in late summer and Jesus was crucified at the time of the Passover in the spring, Africanus' date for the Passion corresponds to AD 31. The fragment does not include a calendar date, but Africanus is the likeliest source for Sunday, 25 March as the date of the Resurrection in the Greek church (see Ch. 17).

Annianus of Alexandria, a contemporary of Theophilus about AD 400, retained what seems to have been Africanus' date for the Resurrection on 25 March, but changed the year to AD 42 for reasons that will be explained in Ch. 16. George Syncellus (1. 1–20) adopted that date. It was the historically more plausible date on Sunday, 25 March AD 31, that ultimately prevailed in the Greek church. George Cedrenus (i. 334. 3, 344. 18) says that the Resurrection occurred on 25 March of the cosmic year 5539, which corresponds in the Byzantine chronological system to AD 31.

6. ASTRONOMICAL CALCULATIONS

By modern astronomical calculations, neither of the traditional dates—25 March AD 29 or 23 March AD 31—is an acceptable date for the Passion.

A list of dates for both the new and the full moon at the approximate time of the vernal equinox during the period from 25 BC to AD 38 is available through the website of the United States Naval Observatory.[11] In AD 29, the new moon was at conjunction with the sun at the longitude of Jerusalem on 4 March about 3.00 a.m. The first crescent should have been observable in the evening of 5 March, so that the 14th day of the moon would have begun in the evening of 18 March—too early to accommodate the traditional date of 25 March. In the year 31, there was a new moon on 12 March about 2.00 a.m. in Jerusalem. The first crescent would have appeared the evening of 14 March,

[11] http://aa.usno.navy.mil/data/docs/SpringPhenom.php, accessed 12 Feb 2008.

and the 14th day would have begun the evening of 27 March—too late to accommodate the tradition.

Most scholars favour either Friday, 7 April of AD 30, following the full moon of 6 April, or Friday, 3 April of AD 33, on which date there was an astronomical full moon.[12] E. J. Bickerman (1968: 26) warned that, given the poor state of our knowledge about how the Jerusalem authorities regulated the religious calendar in this period, all such attempts to the date the Passion astronomically are futile. Leo Depuydt (2002), however, has recently argued that the authorities would have observed the moon in such as way as to make Friday, 18 March AD 29, the most likely date. Nikos Kokkinos (1989) favours 30 March AD 36, on the grounds that the Passion occurred after the death of John the Baptist, which he dates to AD 35.

7. THE COUNCIL OF NICAEA AND THE DATE OF EASTER

In the 190s, Irenaeus and others advocated an attitude of tolerance and even respect towards the ancient tradition of the Asian Quartodecimans. By 325, when the first Ecumenical Council met at Nicaea (now the village of Iznik, about 100 miles south-west of Istanbul), there was little tolerance left for disagreement about much of anything. Our principal source for the work of the council is the *Ecclesiastical History* of Socrates Scholasticus (*c.*380–450). Socrates says (*HE* 1. 8) that the churches of the time were troubled both by the Trinitarian controversies and by the continued practice of the Asian churches of observing the Paschal season 'in accordance with the custom of the Jews'. According to Socrates, the emperor Constantine summoned the council to settle both of these issues. Those present discussed and ruled on a number of other matters as well. Eustathius of Antioch was a member of the council. In a letter preserved by the church historian Theodoret (*HE* 1. 8), Eustathius estimates that about 270 bishops were present. Athanasius of Alexandria was also present. In his *History of the Arians* (66), written in 357, Athanasius estimates the number of those present as more than 300. In a letter to the bishops of Africa written about 370, he gives the number as precisely 318 (*PG* 26. 1032). Later Christian tradition accepted that number as canonical, and the council is often referred to as 'the 318 Fathers'. St Ambrose explains the symbolism of the number (*De fide* 1. 3, 1. 18). According to Gen. 14: 14, Abraham had 318 men born in his house. In Greek, Ambrose points out, the

[12] Strobel 1977: 70–8; Meier 1991: 401–2; Finegan 1998: 353–62.

symbol for 300 is the letter tau, the symbol of the cross, and 18 is written as iota-eta, the first two letters of 'Iesus'.

No agreement on the observance of Easter appears in the extant Canons of Nicaea as preserved by Dionysius Exiguus and his successors. Socrates (*HE* 1. 9. 1–14) preserves a letter on that subject from the bishops present at the council, addressed to the churches in Egypt, Libya, and Alexandria and summarizing the work of the council. The writer, who seems to have been a member of the Egyptian delegation, states that the Council determined that all should 'henceforth conform to the Romans and to us, and to all who from the earliest time have observed our period of celebrating Easter'. Eusebius of Caesarea, who was present at the council, preserves in his *Life of Constantine* (3. 7–18) a long letter of Constantine, addressed to the churches in general, devoted entirely to the subject of the Paschal observance. The council decided, Constantine says, that the churches everywhere should all observe Easter on the same day and not in accordance with the custom of the Jews. This prohibition against keeping Passover 'with the Jews' was interpreted in ancient times as directed specifically against Quartodecimanism and as precluding the observance of Easter on the 14th day of the moon, even if that day were a Sunday. That rule appears explicitly in the prologue of Theophilus (Krusch 1880: 225). Modern scholars have thought that Quartodecimanism as such was a dead issue by this time and that this prohibition against the custom of the Jews meant that Christians should not follow or accept the practice of any local Jewish community for determining the date of the 14th moon, but should make that determination independently and by a method that would produce ecumenical agreement.[13]

Dionysius Exiguus attributed to the Council of Nicaea both the formal adoption of a 19-year cycle for determining the date of the Paschal moon and the promulgation of the specific rule that Easter should be the first Sunday after the first full moon on or after the vernal equinox (Krusch 1938: 65; see Ch. 4). Denis Petau and other early modern scholars followed Dionysius in this error.[14] Johann Wilhelm Jan, however, in the introduction to his 1718 edition of Dionysius Exiguus, refuted the tradition that the council had authorized a 19-year cycle (*PL* 67. 458–9). Fifty years later, Christian Wilhelm Franz Walch (1770) argued that the council had not explicitly enunciated a rule of the equinox, either. Ludwig Ideler (1825–6: ii. 206) accepted these arguments. The belief in a Nicene rule nevertheless persisted. L. Duchesne (1880) and again F. Daunoy (1925) found it necessary to deny Nicene

[13] Duchesne 1880; Schwartz 1905: 104; Cameron and Hall 1999: 259–61; Stern 2001: 67–8, 80–5.

[14] Petau 1703, book 2, ch. 67, p. 116, book 5, ch. 8, p. 221.

authority for any rule on the date of Easter Sunday. Most recently, Max Lejbowicz (2006: 30–2, 50–60) has reviewed the evidence anew and tried to explain how this 'myth' of a Nicene Paschal rule came into being shortly after the council met.

This denial to Nicaea of any Paschal rule may have gone too far. Eusebius (*HE* 7. 20) attributes to Dionysius, bishop of Alexandria in the 250s, a rule that 'at no time other than after the spring equinox is it legitimate to celebrate Easter'. Shortly thereafter, according again to Eusebius (*HE* 7. 32. 17), Anatolius—an Alexandrian who became bishop of Laodicea in Asia—modified the rule to provide explicitly that the Paschal full moon itself must follow the equinox. The *Chronicon Paschale* quotes (5. 2–5) from a letter attributed to Peter, bishop of Alexandria between about 300 and 311, in which Peter defends the rule of the equinox. By deferring to Rome and Alexandria the council endorsed whatever methods were in use in those churches and trusted the bishops of Rome and Alexandria to resolve any disagreements. It is therefore fair to say that the Council 'apparently' or 'implicitly' endorsed the rule of the equinox, even if it published no rule as such.[15]

8. LUNAR AND SOLAR CYCLES

In his discussion of the Quartodeciman controversy, Eusebius informs us that by the end of the second century bishops of different cities and regions were exchanging letters to ensure that they would keep Easter on the same day. He quotes (*HE* 5. 25) from the end of a letter signed by the bishops of Palestine during the reign of Commodus (180–92), where the signators state they send letters to Alexandria and the Alexandrians to them to be sure that they keep the holy day in harmony and at the same time.

Such letters would have to be exchanged well in advance of any actual observation of the first crescent of the Paschal new moon. For the purposes of maintaining uniformity in the date of the festival, therefore, it was necessary to calculate the date of the Paschal moon in advance. One would want to do so on the basis of a method that permitted the generation of a list of new moons that would repeat itself after the shortest possible period. Thus, once one has calculated the new moons for one cycle, the dates can be projected forward indefinitely. The problem is that the lunar cycle is incommensurate with the solar cycle. The phases of the moon repeat themselves after a period

[15] Richards 1998: 349; Mosshammer 1998: 358.

of about 29½ days. The vernal equinox and other signs of springtime return on a cycle of approximately 365¼ days.

In a standard lunar calendar, the months alternate between 29 days and 30 days. Twelve lunar months averaging 29½ days fall short of the Julian calendar by 11 days and six hours. Therefore, each year the calendar date of the new moons will be eleven days earlier than in the previous year, twelve days in a leap year. One needs to find the shortest period in which a whole number of lunar cycles averaging 29½ days will approximate a whole number of solar cycles averaging 365¼ days. The differential between the moon and the sun will accumulate to 33¾ days over a three-year period, so that one will have to intercalate an additional lunar cycle approximately every three years.

Geminus and Censorinus both give brief histories of Greek astronomy and calendars. In a long chapter 'On Months', Geminus says (8. 27–49) that the first period 'the ancients' used to coordinate the lunar cycle with that of the sun was the 'octaëteris', or 8-year cycle. Over an eight-year period, the differential of 11¼ days between the lunar and solar cycles will accumulate to exactly 90 days. Therefore, Geminus says, the ancients decided to construct a cycle consisting of 96 months averaging 29½ days and three intercalary or 'embolismic' months of 30 days for a total of 99 months and 2,922 days ($8 \times 365.25 = 2{,}922 = 96 \times 29.5 + 3 \times 30$).

Geminus does not mention any names, but Censorinus says (18. 5) that some authorities attribute the cycle to Eudoxus of Cnidus. Eudoxus was a mathematician and astronomer of the fourth century BC. The Byzantine lexicon known as the *Suda* says (epsilon, 3429) Eudoxus wrote a treatise 'On the Octaëteris'. Eudoxus seems therefore to have been a commentator on the 8-year cycle, rather than its inventor. Censorinus himself attributes the octaëteris to Cleostratus of Tenedus, who seems to have lived in the latter part of the sixth century BC (Fotheringham 1919).

Geminus points out that there is actually an arithmetical difference of 1½ days between 99 lunations averaging 29½ days and eight years of 365¼. More precisely, the average lunation is 29 days plus 31/60 plus 50/3600 (plus a few more subdivisions that may be corrupt in the text), so that there are $354 + 1/3$ days in 12 lunar months. The true difference between the lunar and the solar cycles is therefore $10 + 11/12$ days per year, not 11¼, and over an eight year period the difference is $87 + 1/3$ days, which is not three full months. Therefore, Geminus says (8.5 0), the astronomers Euctemon, Philip, and Callippus constructed another, more nearly accurate period, this one of nineteen years.

This 'enneakaidekaëteris' or 'cyclus decemnovennalis' is better known as the 'Metonic cycle'. Diodorus of Sicily says (12. 36. 2) that Meton invented a 19-year cycle at Athens in the archonship of Apseudes, 433/2 BC, and that people therefore call the cycle the 'Metonic year'. Geminus names Euctemon, Philip, and Callippus, but does not mention Meton. Censorinus (18. 8) attributes the 19-year cycle to Meton, without naming the others. We know a little about Meton, almost nothing about the others.[16] Meton was an Athenian citizen, whose work as a geometer Aristophanes made sport of in the *Birds* (993–1020), produced in 414 BC. Theophrastus, writing about a hundred years later, says (fragment 6. 4 Wimmer) that Meton made observations of the summer solstice and devised the 19-year cycle. An ancient commentator on *Birds* 997 cites the Athenian historian Philochorus (*c.*250 BC) for the statement that in the archonship of Apseudes Meton set up an instrument called a 'heliotrope' on the hill where the Athenian assembly met. The heliotrope was probably an instrument for observation of the solstices. Claudius Ptolemy (*Almagest* 3. 1) says that Meton and Euctemon observed the solstice during the archonship of Apseudes at a date corresponding to 21 Phamenoth in the Egyptian mobile calendar, equivalent to 22 June 432 BC.

We know nothing of Euctemon except that he was a colleague of Meton. Of Philip, Hermodorus of Syracuse says (fragment C) that he was an astronomer and mathematician from the south Italian town of Medma (Rosarno), who studied with Plato. Callippus was a native of Cyzicus who took up residence in Athens and became an associate of Aristotle. Aristotle mentions him as having refined the geometric theory for explaining the apparent motion of the planetary objects (*Metaphysics* 1073^{b}32–8). Geminus says (8. 59) that Callippus revised the 19-year cycle to make it conform to a solar year of exactly 365¼ days, instead of the 365 + 5/19 days implied by the Metonic cycle. To this end, he put four such cycles together to make a period of 76 years (the 'Callippic' cycle), subtracting one day every 76 years in order to compensate for the error.

Scholars debate whether these Greek mathematicians invented the 19-year cycle independently or borrowed it from the Babylonians. In Babylon a 19-year cycle was in use for regulation of the calendar certainly by the fourth century BC.[17] How much earlier than the fourth century the Babylonians used the cycle and how early therefore the Greeks could have 'borrowed' it remains undecided.[18] Whether the Athenians actually used the Metonic cycle for regulation of the calendar also remains open to debate. Robert Hannah (2005: 52–70) has recently argued that Athenian officials might have used the 19-year cycle to regulate the festival calendar, even if not the civil calendar.

Geminus (8. 53–9) explains the structure of the 19-year cycle. It consists of 6940 days and 235 lunar months, including seven intercalary months. This produces a year of 365 + 5/19 days. There are 110 'hollow' months of 29 days

16 On Meton, see Hannah 2005: 52–70.
17 Parker and Dubberstein 1956; Hannah 2005: 85.
18 Neugebauer 1975, i. 354–7.

and 125 'full' months of 30 days, including the seven intercalary months. In the 19-year cycle the alternation of full and hollow months is adjusted to yield 110 hollow months and 125 full months in order to make the total number of lunar days equal to the 6940 days in 19 solar years.

By modern astronomical calculations, the correspondence between 235 lunations and 19 solar years is nearly exact. The tropical year averages 365.24219 days.[19] The synodic lunar month averages 29.53059 days.[20] The difference between 235 synodic months ($235 \times 29.53059 = 6939.6887$) and 19 tropical years ($19 \times 365.24219 = 6939.6016$) is only two hours and about three minutes. In relation to the Julian year of 365¼ days, the difference is even less—one hour and 25 minutes.

A 19-year cycle therefore offers just the tool that early churchmen needed for predicting the date of the Paschal moon. Before adopting that cycle, however, the bishops who exchanged letters to assure uniformity in their observances experimented with a calculation that produced an 8-year cycle. Cycles of 30 and 84 years were also in use. By definition, a lunisolar cycle of any kind always begins with the new moon at the same date in the solar calendar as in the first year of the previous cycle. For the purposes of an Easter table that is to be truly periodic one wants not only the Paschal full moon to return to the same calendar date, but also the date of Easter Sunday. In the Julian calendar, the days of the week repeat in a complete series only after 28 years—the 7 days of the week multiplied by the four years of a leap-year cycle. An 84-year cycle accomplishes the objective, as does a period of fourteen 8-year cycles, both of which were in use in the Roman church at different times (see Chs. 7 and 11). That periodicity comes, however, at the expense of accuracy in the lunar repetitions.

The smallest set of 19-year cycles in which the total number of solar days will approximate a multiple of 7, without exceeding it, is 5. In 95 years, there are 34,698¾ days. The number 34,699 is a multiple of 7. So, more often than not, depending on exactly how the leap years appear at the beginning and end of a 95-year period, the Paschal moon will return after 95 years not only to the same day in the month, but also the same day in the week. It is therefore possible to build one 95-year cycle of Easter dates and base the next 95-year cycle upon it simply by observing the effect of leap year at the beginning of the new period. The Easter table of Dionysius Exiguus is an example of a 95-year period built upon an expiring exemplar.

[19] Newcomb 1895; Borkowski 1991.

[20] Chapront-Touze and Chapront 1988.

This page intentionally left blank

Part II

The Easter Tables of Dionysius Exiguus

This page intentionally left blank

4

The Letters to Boniface and Petronius

1. THE WORK OF DIONYSIUS EXIGUUS

In what we call the early sixth century AD, Dionysius Exiguus completed work on a 95-year table of Paschal full moons and Easter Sundays, covering the period that he numbers as 532 through 626 *anni domini*, 'years of the Lord'. The standard edition of that table and its accompanying documents is that of Bruno Krusch (1938).

To the 95-year table Dionysius appended a set of rules (*argumenta*) for calendrical calculations that he says he adapted from 'Egyptian science'. He also included a translation of a letter from Proterius, bishop of Alexandria, to Leo, bishop of Rome, written in AD 454, in which Proterius explains and defends the Alexandrian calculations in support of the Alexandrian date for Easter on 25 April 455 (Krusch 1880: 269–76).

Dionysius sent this work, along with a prefatory letter, to one Bishop Petronius. In this letter (Krusch 1938: 63–8), Dionysius states that there are now six years remaining in a 95-year table composed by Cyril of Alexandria that Dionysius used as the basis for his own work. Since his own table began in the year 532, the six years correspond to 526–31. We can therefore infer that it was in the year AD 525 that Dionysius completed his work. The same conclusion follows from the heading of the tables and the first *argumentum*, where Dionysius designates the present year as the consulship of Probus and the third year of an Indiction.

Shortly thereafter, Dionysius sent a letter to the Apostolic Chancellor and future Pope Boniface through Boniface's secretary, Bonus (Krusch 1938: 82–7). Dionysius responds to some questions that Boniface had raised about the difference between ordinary and embolismic years. Dionysius also addresses a question about the lunar data for the forthcoming Easter Sunday on 19 April. Dionysius designates the year in question as the present year, the fourth Indiction. That would be the indictional year 525/6, and 19 April did fall on a Sunday in AD 526. For that year, in the portion of the table that Dionysius had repeated from his source, 19 April was designated as the 21st day of the moon. In another table that Boniface consulted, the date appeared as the 22nd of the moon.

The table to which Boniface referred showing 19 April as the 22nd day of the moon must have been the 532-year list that had been prepared by Victorius of Aquitania at the request of the archdeacon and future pope Hilarus (see Ch. 11). That list (Krusch 1938: 51) does calculate 19 April in the year corresponding to 526 as being the 22nd day of the moon.

In his response, Dionysius does not name a consul for the year in question. It seems likely therefore, as C. W. Jones suggested (1943: 68–9), that Dionysius wrote the letter late in the year 525, after he had transmitted his Paschal tables through Petronius to Boniface, and after the fourth indictional year had begun in September, but before new consuls for the year 526 had been designated.

In the letter to Boniface, Dionysius says that it was at the suggestion of Petronius that he undertook this work. There are no other references to this Petronius. We do not know who he was or what his connection with the papal offices. Clearly, Dionysius presented the work to Petronius, who forwarded it to Boniface. Krusch (1938: 59) thought that Pope John I (523–6) had asked Boniface to commission this work, precisely in order to resolve any questions about Easter for the year 526. It is true, as we shall see, that John made inquiries about the date for 526. Resolving that issue seems too narrow a purpose for a work of the scope that Dionysius undertook. Jones (1943: 68–9) has rightly argued that what prompted Petronius to request a new table was simply that the old one—i.e. the Cyrillan table ending in 531—was about to expire.

Whoever Petronius was and whatever prompted him to approach Dionysius for the preparation of a new table, Pope John clearly took an interest in the work. Krusch (1926) published a document under the heading, 'Memo from Boniface the Primicerius to John the Pope', in which Boniface advises the Pope that the 14th day of the moon, in the present fourth indictional year, will occur on Sunday, 12 April, and that Easter should therefore be observed the following Sunday, the 21st day of the moon. At the beginning of the memo, Boniface states that it was at John's request that he made inquiries about the age of the moon for the forthcoming Easter. Boniface does not name Dionysius, but in words that paraphrase the beginning of the letter to Petronius he does commend to John the 19-year cycle that the Nicene fathers had approved. Here he repeats the erroneous claim about the Council of Nicaea that Dionysius included in the letter to Petronius.

It seems likely that a copy of Dionysius' Paschal table accompanied this memo, if indeed John did not already have a copy. Dionysius' work therefore quickly found a place in the papal library, whether or not it was a papal request that had occasioned it. Nevertheless, as Jones (1943: 27–8, 60–1, 74–5) has emphasized, neither the tables of Dionysius nor those of Victorius had any official standing. It was the responsibility of the bishop to announce the date of Easter, and tables were no more than a tool.

The work *De Paschate* of Dionysius Exiguus stands towards the end of the history of Paschal calculations in the late antique church, almost 300 years after Anatolius of Alexandria and Laodicea had published the first Paschal tables based on the 19-year cycle (see Ch. 8). Because new tables tend to drive their predecessors out of circulation, the 95-year table of Dionysius is the earliest extant representative of the Alexandrian Easter tables that derive from Anatolius. A document known as the 'Festal Index', or 'Athanasian Index' as I prefer to call it, is an older witness to the Alexandrian calculations, dating from the 370s or shortly thereafter (see Ch. 9). That text contains data culled from a Paschal table, but it is not itself an example of a Paschal cycle. A 95-year table covering the years 429–523 is also older than the table of Dionysius, but that list contains only the date for Easter and the age of the moon as of that date (see Ch. 8).

The oldest manuscripts of the 95-year table date from the ninth century (Krusch 1938: 60–1). The earliest representative is a 95-year list of dates for the Paschal full moon and for Easter Sunday for the period AD 532–626, inscribed in a circular form (*rota paschalis*) on a marble tablet on the cathedral at Ravenna (now in the Museo Arcivescovile). Enrico Noris (1696) first published the text and took it as evidence that the Dionysian table was adopted in northern Italy, as well as at Rome, within the lifetime of Dionysius or shortly thereafter. Krusch (1884: 114) argued on the contrary that the Ravenna rota was based directly on a Greek model. Eduard Schwartz (1905: 21) accepted that argument, although Franz Rühl (1897: 131) had expressed doubts. Recent scholars have returned to the view of Noris—the Ravenna rota is an adaptation of the 95-year table of Dionysius Exiguus, inscribed in the sixth century.[1] An early witness to the use and extension of the list is a 19-year Paschal cycle for the period 684–702 appended to a seventh-century liturgical calendar that belonged to St Willibrord of Northumbria.[2]

Since the 95-year table of Dionysius is the oldest exemplar of the classical Alexandrian cycle, the best way to examine the structure and content of that cycle is through the writings of Dionysius. It is only after mastering the technical elements of the cycle as Dionysius presents them that one can seek to reconstruct their history.

[1] So Mijović 1967, although he wrongly describes it as a 94-year list and attributes a 532-year cycle to Dionysius.

[2] Paris, BN lat. 10837, fo. 44^{r}; Wilson 1918; Ó Cróinín 1989: 195.

2. THE LETTER TO BONIFACE

In the letter to Boniface and Bonus, Dionysius says that he has striven in his work to remove all ambiguity and dissent about the rules for observing the Paschal season, relying on the fact that the 318 fathers who convened at Nicaea had used the 19-year cycle to determine the 14th moons. He devotes most of the letter to discussion of the difference between common and embolismic years.

Boniface had found in the Papal archive a letter that Paschasinus had written to Pope Leo of Rome on the subject of Easter for the year 444. Paschasinus was bishop of the Sicilian city of Lilybaeum (Marsala) and later served as Leo's legate to the Council of Chalcedon in 451.[3] In the letter (Krusch 1880: 247–50), Paschasinus says that he has come to the conclusion that the bishop of Alexandria is correct in maintaining that Easter should be observed on Sunday, 23 April, the 19th day of the moon. The Roman calculation, he says, provided either Sunday, 26 March, the 21st day of the moon, or Sunday, 23 April, the 19th day of the moon, leaving the matter ambiguous. To settle the issue, Paschasinus looked at the question of when the Passover according to the Jewish law would occur—something he says the Romans often neglect.

Here Paschasinus says, literally translated, that he 'turned his attention to the Hebrews'—that is, to the legal—calculation, since the which it is unknown to the Romans, they easily run into error'. Jones (1943: 55–6) understood this as a reference to a Paschal table unknown to the Romans and wondered why Paschasinus referred to it as a 'Hebrew table'. He concluded that the table must have been the one that Dionysius attributed to Cyril, because Paschasinus goes on to inform Leo that the year in question was the eighth year of an ogdoad that began in the consulship of Aetius and Segisvultus, AD 437. The only table we know that was organized by ogdoads and hendecads, with an ogdoad beginning in that year, was the Cyrillan 95-year table beginning in AD 437.

Jones was right to identify the table that Paschasinus consulted with Dionysius' Cyrillan exemplar. By the phrase *Hebraeorum hoc est legalem supputationem*, however, Paschasinus was referring not to a table of the Hebrews, but to the calculation of the Hebrews, that is, the calculation according to the law. The phrase is reminiscent of what the Greeks refer to as 'the Pascha of the Law' (*Chronicon Paschale* 24. 2) by which they mean the 14th day of the moon. What is unknown to the Romans, according to Paschasinus, is the correct method for calculating that date.

As the eighth year of an ogdoad, Paschasinus says, the year must be embolismic. In the previous year, Easter was on 4 April. An embolismic year has 13

[3] Leo to Paschasinus, Letter 88.

lunar months. Accordingly, one cannot observe Easter twelve lunar months later on 26 March, but must move the date forward until after the next full moon in April. Although the date of 23 April exceeds the usual Roman limit for Easter on 21 April, Paschasinus encourages Leo not to be concerned on that account.

Paschasinus proceeds to tell a story about what happened at Eastertide in the eleventh consulship of the emperor Honorius (AD 417). Easter should have been observed on 22 April, but was observed instead on 25 March, because of failure to recognize that the year was embolismic. In a certain humble church at a remote place in the mountains called Meltinas (now a suburb of Marsala), the baptismal font always filled spontaneously at the Easter vigil when it came time to perform the baptisms. Because of the error in the western calculations, Paschasinus says, when the priest at midnight on 25 March called upon the font to fill with water, it failed to do so. Yet on the eve of 22 April, the font spontaneously filled at the appropriate time.

In responding, Dionysius says that he is happy to have the testimony of Paschasinus to support his own views. The difference between common and embolismic years has been the subject of some dispute, he says, and he will therefore offer a brief explanation.

Dionysius explains that a common year has 12 lunar months totalling 354 days, while an embolismic year has 13 lunar months and 384 days. Common and embolismic years are distributed through the 19-year cycle in such a way that the excess of the latter with respect to the solar year compensates for the deficiency of the former. He divides the 19-year cycle into sections of eight and eleven years, there being three embolismic years in the ogdoad (eight-year segment) and four embolismic years in the 11-year segment (the hendecad). So in common years there will be 354 days from the 15th day of the moon in one year to the 14th day of the moon in the next year, 384 days in embolismic years. There is, however, an exception at the first year of the cycle, where one counts the 384 days from the 14th day of the moon in the last year of the cycle, instead of the 15th. The reason is that in the first year of the cycle, the age of the moon (the 'epact') advances by 12 days, instead of 11, moving from 18 to 30. Since 30 days is the limit, Dionysius says, 'no epact' is placed at the first year of the cycle. The epact and why there is a difference at the first year of the cycle are discussed in Ch. 5.

Dionysius takes 'the present year' as an example. It is the fourth Indiction and the 14th year of the cycle (i.e. AD 525/6). Thus it is an embolismic year. Last year, the 14th day of the moon fell on 24 March. From that date to the 14th moon of this year there must be an interval of 384 days. If one counts the 384 days from the 14th day of the moon on 24 March of last year, one will find that the 14th moon this year must be on 12 April. Those who do not reckon in accordance with the truth put the 14th moon on 11 April, which allows only 383 days and is clearly unacceptable.

Dionysius concludes the letter by listing each of the 19 years of the cycle and stating how many days are to be counted from the 14th moon of the previous year to the 14th moon of the current year.

Although Dionysius does not say so, we know that the erroneous calculator to whom he refers is Victorius of Aquitania. Since Victorius designated 19 April as moon 22, his date for the Paschal moon was 11 April (Krusch 1938: 51). The Roman calculation to which Paschasinus referred was the 84-year cycle (see Ch. 11).

3. THE LETTER TO PETRONIUS

The letter to Petronius serves as an introduction to the 95-year table. Dionysius is concerned primarily with defending the mathematical accuracy and ecclesiastical authority of the Alexandrian 19-year calculation.

i. Nicene Authority

Dionysius states at the beginning of the letter that the 318 bishops who convened at Nicaea had established the 19-year cycle as a firm anchor for Paschal calculations and had done so not as a matter of secular expertise, but by the inspiration of the Holy Spirit. It is most unfortunate, he says, that some persons, out of arrogance or ignorance, have introduced a contrary method. At Alexandria, bishop Athanasius and his successors Theophilus and Cyril have carefully preserved the Nicene rules. Theophilus composed a table of 100 years dedicated to Theodosius the first. Shortly thereafter, Dionysius says, Cyril drafted a table of 95 years. Both sets of tables, Dionysius emphasizes, carefully preserved the Council's decisions. The 100-year list of Theophilus is not extant. We do have a Latin translation and some Greek excerpts of his preface (see Ch. 10).

Modern scholars have proved Dionysius wrong in claiming Nicene authority for his work (see Ch. 3). Christian Wilhelm Walch (1770: 48) thought that Dionysius had made an incorrect inference from the letter of Proterius to Leo, in which the bishop of Alexandria informs the bishop of Rome that 'our Blessed Fathers established the 19-year cycle as a rule' (Krusch 1880: 276). Krusch (1884: 107) characterized the error as a 'pious fraud'. Bartholomew Mac Carthy (1901: lvi) went so far as to describe Dionysius' claim as 'one of the most audacious falsifications on record'. Schwartz called Dionysius a 'deliberate falsifier' (1905: 22–3) in this as in some other matters.

Jones (1943: 71) came to Dionysius' defence. Gennadius of Marseille (*De viris illustribus* 34), writing thirty years before Dionysius made this claim, had already stated in his biographical notice on Theophilus that the Council of Nicaea adopted the 95-year period. St Ambrose of Milan, in a letter on the proper date for Easter in the year 387, said that Nicaea had explicitly authorized the 19-year cycle.[4] When Proterius attributed the 19-year cycle to 'our Blessed Fathers' he may well have been referring to the 318 Fathers of Nicaea, rather than the fathers of the Alexandrian church, as Walch had supposed. Indeed, Leo himself seems to have understood the phrase as a reference to Nicaea. In his letter to the emperor Marcian on the forthcoming problem of Easter in the year 455 (Krusch 1880: 258), Leo said that 'the Holy Fathers, in order to remove any occasion for error delegated all care to the Alexandrian bishop, since there was among the Egyptians an ancient science for the computation'. The phrase 'Holy Fathers' is vague. Jones (1943: 29 n. 2) suggested that Leo might have been referring to the Council of Sardica, at which we know that Easter calculations were under discussion (see Ch. 9). But the delegation of authority to Alexandria is precisely what we know about the decision at Nicaea.

Dionysius was neither alone nor without precedent in claiming Nicene authority for the 19-year cycle. As Max Lejbowicz (2006: 50–60) has shown, the attribution of a 19-year cycle to the Council of Nicaea was well established by the end of the fourth century.

ii. The Cyrillan Exemplar

Another charge of deception levelled against Dionysius is his attribution to Cyril of the 95-year exemplar, covering the years corresponding to 437–531, of which his own work was no more than a continuation. Cyril is well known as a theologian who presided over the Council at Ephesus in 431 and defended the use of the word *Theotokos*, 'Mother of God', in reference to the Virgin Mary (Socrates 7. 34). He was the nephew of Theophilus and succeeded him as bishop of Alexandria on 17 October of the year corresponding to 412 (Socrates 7. 5). It was during the fourth year of his episcopate that the philosopher Hypatia, daughter of the astronomer Theon, was murdered by a mob (Socrates 7. 15). Edward Gibbon (1788: ch. 47) accused Cyril of instigating the lynching. We do not know the exact date of Cyril's death.

4 Ambrose, Letter on Easter (*Extra collectionem* 13. 1); Zelzer 1978; Lejbowicz 2006: 50–1.

Nicephorus Callistus (*HE* 14. 47) says that he served as Patriarch of Alexandria for 32 years. The Greek church observes his feast day on 9 June as the anniversary of his birth. The Latin church commemorates him on 27 June. Some authorities date his death to 27 June AD 444 (Russell 2000: 58).

Until 1907, apart from the testimony of Dionysius and later authors dependent on him, the only other evidence for a Cyrillan Easter table was a document purporting to be a Latin translation of its preface, which was first published by Denis Petau in 1627.[5] Krusch (1880: 89–98) demonstrated that this text could not possibly be authentic. Krusch did not deny Cyrillan authorship of the 95-year table. Schwartz (1905: 22–3), however, proclaimed that any connection of the name of Cyril with an Easter table was fraudulent. Shortly thereafter, F. C. Conybeare (1907: 215–21) published, with English translation, an Armenian version of a letter of Cyril addressed to the emperor Theodosius II. In the letter, Cyril paraphrases the prefatory tract of Theophilus and states that he has himself composed a table covering 110 years, beginning from the first consulship of Theodosius II, AD 403.

I shall discuss the Easter tables of Theophilus and Cyril in Ch. 10. The 95-year table beginning in 437 that Dionysius used is not the same as the 110-year table beginning in 403 that Cyril mentions in his letter. It is, however, as noted above, the same table to which Paschasinus refers in his letter to Leo. Jones (1943: 55–6) thought that table circulated anonymously and that Dionysius only surmised, perhaps correctly, that it was the work of Cyril. Yet Paschasinus refers to a letter to Leo from the bishop of Alexandria on the disputed date for 444, in which Paschasinus says he found the correct calculations. Leo sent a copy of that letter to Paschasinus for comment. It is likely that the Alexandrian table with its ogdoad beginning in 437 accompanied that letter. Since Cyril became bishop in October of 412 and served for 32 years, it must have been he who wrote that letter and sent the table.

A fragment from such a letter is extant (Krusch 1880: 345–9). The writer defends a date for Easter on 23 April and refers to the 19-year cycle as having been adopted at Nicaea. Krusch (1880: 101–9) argued that the letter is another example of a seventh-century forgery. It may nevertheless in fact be genuine. In anticipation of debate about the date for Easter in 444 and again in 455, and in an effort to forestall future such disputes, Cyril may very well have directed his staff to prepare a 95-year table beginning in 437, adapted to the Roman calendar and for use in the western churches.

Jones (1943: 48, 54, 72) thought that the attribution of the table beginning in 437 to Cyril was an inference on the part of Dionysius Exiguus and that Dionysius may well have been right. Georges Declercq (2002: 179 n. 32) says that a 'direct or

[5] Petau 1703, vol. ii, Appendix; critical text Krusch 1880, 337–43.

indirect involvement of Bishop Cyril of Alexandria can, in our opinion, not be excluded'. It is time to be positive on the matter. Dionysius Exiguus was telling the truth. He had before him a 95-year table to which the name of Cyril had already, probably rightly, been attached. That document certainly had an appendix of calendrical rules on which Dionysius says he based his own *argumenta*. In all likelihood, it also had a preface, from which Dionysius drew some at least of the information that he included in his own prefatory letter. That preface would in turn have been based on the extant 'Prologue of Theophilus' and updated by Cyril or someone working at his direction. Cyril was an aggressive churchman. In his efforts to impose the Alexandrian 19-year cycle upon the west he may well have claimed Nicene authority for it.

iii. Years of the Lord

Dionysius says that his only innovation with respect to the Alexandrian cycle is his decision to number the years from the Incarnation of the Lord, instead of from the first year of Diocletian:

> This cycle of 95 years, we have striven with as much care as we could to prepare. The last—that is, the fifth—cycle of the blessed Cyril, since there are still six years remaining of it, we have prefaced to our own work. We have then composed five additional cycles, following the method of that pontiff, and indeed of that oft mentioned Nicene Council. Since Saint Cyril began his first cycle from the 153rd year of Diocletian and ended his last at the 247th, we have begun from the 248th year of that same ruler—more a tyrant than a prince. But we did not want to perpetuate the memory of that impious persecutor in our cycles, so we have chosen rather to number the years from the Incarnation of our Lord Jesus Christ, so that the beginning of our hope might stand out more clearly for us, and so the cause of human salvation—that is, the Passion of our redeemer—might shine more conspicuously.

This is all that Dionysius has to say on the subject of years numbered *ab incarnatione domini*. Beside this reference and the numbered column of *anni domini* in the Paschal tables themselves, Dionysius mentions numbered years since Christ only in the rules (*argumenta*) for calendrical conversions that he appended to the tables—and nowhere else in the extant corpus of his writings. In the heading of the tables, he designates the present year as the third Indiction, the consulship of Probus, the 13th year of a 19-year cycle, and tenth year of a lunar cycle, with no reference to years as numbered either from Diocletian or from the Lord.

This silence about how he knew that Diocletian 248 should be equated to AD 532 has led to all manner of speculation about how Dionysius calculated his date for the birth of Christ. Those speculations are the subject of Ch. 15.

Only in recent years have scholars begun to realize that the silence of Dionysius on this subject implies that he did not calculate a date at all, but adopted an already established tradition from one source or another (Holford-Strevens 1999: 778). In Chs. 16–18, I will trace the Christian era of Dionysius Exiguus back to its ultimate source.

iv. The 95-Year Period

Dionysius next admonishes his readers to be aware that the 95 years do not constitute a true period and that the tables will not repeat themselves after that interval in every respect. The years of the Lord will continue in consecutive numbering, as will the years of the Indiction within their 15-year cycle, and so too will the data for the age of the moon and the date of the Paschal 14th day of the moon. But the days of the week cannot similarly repeat themselves nor therefore the date of Easter Sunday and the age of the moon on that Sunday. This is because the day of the week on any given date advances by one day from one year to the next, except in leap years when the differential is two. Therefore, in ordinary years, all of the data will in fact repeat after an interval of 95 years, but in leap years the date of Easter Sunday and the age of its moon will differ. Those who use the tables carefully, Dionysius says, can find the points of mobility easily enough and thus construct a continuation.

The periodicity of a 95-year cycle is more complicated than Dionysius here suggests. Even when a 95-year table does return the 14th day of the moon to the same day of the week at the head of the next 95-year period, the dates do not all repeat themselves throughout the 95-year period. In 95 years there are $95 \times 365.25 = 34{,}698.75$ days. Depending on how leap years intervene, there will actually be either 34,698 or 34,699 days between the same calendar dates 95 years apart. The sum of 34,699 days constitutes 4957 whole weeks. Since the 14th day of the Paschal moon always occurs after any leap day, we need consider only those cases. There are 34,699 days between the same date in any two common years and between a date in a common year and the same date in leap year 95 years later. Between a date in leap year and the same date in a common year there are only 34,698 days.

One can see how this periodicity works by looking at the 532-year table that St Bede constructed (Wallis 1999: 392–404). In its first year, AD 532, the Paschal moon is dated to 5 April and Easter Sunday to 11 April. Thus, 5 April was a Monday. Ninety-five years later, in AD 627, 5 April recurs for the Paschal moon, now on a Sunday, so that Easter is postponed to 12 April. The pair 5 April and 12 April recurs at 95-year intervals in 722, 817, and 912. In AD 1007, however, 5 April falls back to a Saturday and a different periodicity begins. In the periodic 95-year tables beginning in 722, 817, and 912, most of the Easter dates repeat themselves in the same order, but there are some exceptions due to leap year. In 724, for example, Easter is on 16 April, but 17 April in 819 and 914; 8 April appears in 725 and 820, but 9 April in 915.

v. The Rule of the Equinox

In the next section of the letter, Dionysius urges care in setting the limits within which the first month must begin and end, for nearly every error in reckoning derives from failure to fix the beginning of the month correctly. Dionysius quotes from Exodus (12: 18) for the rule that in this first of months the Passover is to be observed with unleavened bread from the 14th until the evening of the 21st. In Deuteronomy (16: 1) he finds justification for the rule of the equinox: 'observe the month of new fruits and the beginning of the springtime to keep the Passover to the Lord'. The phrase 'beginning of the springtime' (*et verni primum temporis*) appears only in the Latin Bible.

Since the Law does not specify when this first month begins or ends, Dionysius continues, the 318 Fathers, after carefully investigating the Mosaic tradition, decreed, as the seventh book of the Ecclesiastical History says, that the new moon should fall between 8 March and 5 April and that the 14th of the moon must come between 21 March and 18 April, always following the vernal equinox, which the East in general and the Egyptians in particular with their scientific pre-eminence set at 21 March. If the 14th moon should fall at the equinox on a Saturday, which happens once in a 95-year cycle, then the holy synod affirmed that Easter Sunday is the next day, 22 March, decreeing that one must never look for the 14th moon before 21 March, which would be the end of the last month instead of the beginning of the first month.

The citation of 'the seventh book of the Ecclesiastical History' is presumably a reference to the *Ecclesiastical History* of Eusebius. In that book (*HE* 7. 32), Eusebius quotes a text from Anatolius, author of the earliest 19-year Paschal cycle, where Anatolius states, citing Jewish precedents, that the Paschal moon must come after the equinox (see Ch. 8). Nowhere does Eusebius suggest that the Council of Nicaea promulgated such a rule. Indeed, his history of the church ends before the Council of Nicaea.

The earliest authorities to state explicitly that the equinox occurs on 21 March are Ambrose of Milan in his letter on the proper date of Easter for the year AD 387, and Theophilus of Alexandria in the prologue to his 100-year Paschal list, composed between 385 and 395.[6] The consensus among scholars

[6] Ambrose, Letter on Easter (*Extra collectionem* 13. 16); Prologue of Theophilus, Krusch 1880: 223.

holds that the recognized date of the equinox in Alexandria for the purpose of Paschal calculations was originally 22 March and that the decision to change the date to 21 March entailed a major revision of the Paschal tables. In Ch. 8, I shall argue that 21 March was always the conventional date.

vi. The Lunar Month

Dionysius then advises care in working with the length of a lunar month. Some people, he says, make the mistake of thinking there are thirty days in a month and 360 days in twelve months, to which they then add five days to make up the solar year. In fact, he says, two lunar months have fifty-nine days and there are 354 days in 12 lunar months. To these 354 days the Egyptians make eleven annual additions (*epactas*) to equal the course of the sun. That this is the truth the Fathers affirmed, when they determined that the 14th day of the moon should follow the Egyptian calculation. Unfortunately, there are some people, either too clever or too ignorant, who look for other methods of calculation and wander from the path of truth. It often happens that what the Fathers determined to be the 14th moon, they make the 15th, and what is really the 21st they call the 22nd.

The reference to a year consisting of twelve months of 30 days each plus five intercalary days describes the old Egyptian mobile year. The Egyptians whom Dionysius cites are the authors of the 19-year cycle. The 'too clever' folks who make the 14th moon the 15th and the 21st the 22nd would include Victorius of Aquitania, as the example discussed in the letter to Boniface shows.

vii. Authority of the 19-year Cycle

Dionysius devotes the remainder of the letter to further defence of the divine origin and Nicene authority of these rules. He quotes from his own collection of Canon Law what he calls the 79th canon and the first of Antioch, which excommunicates anyone, whether clergy or layman, who violates the Nicene decision regarding the Paschal observance and observes it at the same time as the Jews. He adds a quotation from Leo, in which 'that venerable Pope of the Apostolic See' condemns any one who departs from any Nicene statute.

This Council of Antioch met at the time of the dedication of the great 'Golden Church'. Athanasius dates the council to the consulship of Marcellinus and Probinus, in the 14th indictional year, that is AD 341 (*De synodis* 25). Dionysius' quotation from the first Canon of Antioch does not really support his position, but only shows how limited the Nicene decision about Easter was. The quotation from Leo comes from the famous letter to Pulcheria Augusta (Letter 105) in which Leo declares null and void the resolution adopted at Chalcedon (Canon 28) conferring upon the See of Constantinople an authority second only to that of Rome.

Dionysius concludes the letter by advising Petronius that he has decided to include as an appendix to his work the letter of Proterius to Leo on the Easter question, which Dionysius says that he had translated from the Greek several years ago. Another appendix, he says, consists of 'some rules (*argumenta*)' devised by Egyptian science. Through these formulae, the Paschal data can easily be found: 'what is the year from the Incarnation of the Lord, what is the Indiction, what is the number of the lunar circuit or of the 19-year cycle, and the rest by similar computation'.

5

The Structure of the 19-Year Cycle

Following upon the letter to Petronius, Dionysius presents six 19-year cycles, headed as follows:

> Here begins the 19-year cycle, which the Greeks call *enneakaidekaëteris*, established by the Holy Fathers; in which you will find the Paschal Fourteenths for any time and without error; just remember for each year what year it is of the circle of the moon and what year of the 19-year period. In the present year it is the third Indiction, during the consulship of Probus the Younger, the thirteenth year of the 19-year cycle, the tenth year of the lunar period. (*PL* 67. 493; Krusch 1938: 68.)

The six cycles consist of the last 19-year cycle in the 95-year table attributed to Cyril and a 95-year continuation prepared by Dionysius. Table 1 reproduces the last cycle of Cyril and the first of Dionysius, translated into Arabic numerals and English dates.

The tables are organized in eight columns: (1) the number of the year, with a 'B' ('bissextile') prefixed to indicate a leap-year; (2) a number from 1 to 15 for the Indiction; (3) the age (epact) of the moon; (4) a number from 1 to 7 for the day of the week; (5) a number from 1 to 19 for the circuit of the moon; (6) the date of the Paschal 14th day of the moon; (7) the date of Easter Sunday; (8) the age of the moon on that Sunday. St Bede, in chs. 47–62 of his 'On the Reckoning of Time', provides a commentary on these Paschal titles. His explanations are sometimes useful, and I will refer to them as appropriate.

1. THE NUMBERED YEARS

The first column displays the sequential numbering of the years. In Cyril's last cycle, the years are headed 'Years of Diocletian' and numbered from 229 to 247. Numbering of the years from the accession of Diocletian as Roman emperor in AD 284 was not a widely used standard in late antiquity, except in Egypt and in the Easter tables (see Ch. 2).

Table 1. The Paschal cycle of Dionysius Exiguus
(*a*) The last cycle of the Cyrillan table, numbered from Diocletian

Bissextile	Year	Indiction	Epact	Days	Lunar Circle	14th day	Easter	Moon
—	229	6	0	1	17	5 Apr	7 Apr	16
—	230	7	11	2	18	25 Mar	20 Mar	19
—	231	8	22	3	19	13 Apr	19 Apr	20
B	232	9	3	5	1	2 Apr	3 Apr	15
—	233	10	14	6	2	22 Mar	26 Mar	48
—	234	11	25	7	3	10 Apr	15 Apr	19
—	235	12	6	1	4	30 Mar	31 Mar	15
B	236	13	17	3	5	18 Apr	19 Apr	15
—	237	14	28	4	6	7 Apr	11 Apr	18
—	238	15	9	5	7	27 Mar	3 Apr	21
—	239	1	20	6	8	15 Apr	16 Apr	15
B	240	2	1	1	9	4 Apr	7 Apr	17
—	241	3	12	2	10	24 Mar	30 Mar	20
—	242	4	23	3	11	12 Apr	19 Apr	21
—	243	5	4	4	12	1 Apr	4 Apr	17
B	244	6	15	6	13	21 Mar	26 Mar	19
—	245	7	26	7	14	9 Apr	15 Apr	20
—	246	8	7	1	15	29 Mar	31 Mar	16
—	247	9	18	2	16	17 Apr	20 Apr	17

(*b*) The first cycle of Dionysius, numbered from the Lord

Bissextile	Year	Indict	Epact	Days	Lunar Circle	14th day	Easter	Moon
B	532	10	0	4	17	5 Apr	11 Apr	20
—	533	11	11	5	18	25 Mar	27 Mar	16
—	534	12	22	6	19	13 Apr	16 Apr	17
—	535	13	3	7	1	2 Apr	8 Apr	20
B	536	14	14	2	2	22 Mar	23 Mar	15
—	537	15	25	3	3	10 Apr	12 Apr	16
—	538	1	6	4	4	30 Mar	4 Apr	19
—	539	2	17	5	5	18 Apr	24 Mar	20
B	540	3	28	7	6	7 Apr	8 Apr	15
—	541	4	9	1	7	27 Mar	31 Mar	18
—	542	1	20	2	8	15 Apr	20 Apr	19
—	543	2	1	3	9	4 Apr	5 Apr	15
B	544	3	12	5	10	24 Mar	27 Mar	17
—	545	4	23	6	11	12 Apr	16 Apr	18
—	546	5	4	7	12	1 Apr	8 Apr	21
—	547	6	15	1	13	21 Mar	24 Mar	17
B	548	7	26	3	14	9 Apr	12 Apr	17
—	549	8	7	4	15	29 Mar	4 Apr	20
—	550	9	18	5	16	17 Apr	24 Apr	21

The year 229, with which the last cycle of Cyril begins, is divisible by 19 with a remainder of 1. Thus, the first year of Diocletian would have been the first year of a 19-year cycle. This fact simplifies calculation. The year of Diocletian divided by 19 will always yield as a remainder the position of the year in that cycle. From that number, as we shall see when we consider the *argumenta*, it is possible, even without access to a table, to generate the lunar data for the year. This coincidence between the first year of Diocletian and the first year of a cycle is a critical point for reconstructing the history of the cycle (see Chs. 9 and 10). As with years AD, if the number of the year since Diocletian is a multiple of four, then it is a leap year.

The decision of Dionysius to renumber the years beginning from the year 532 of the Lord preserves the leap-year calculation, but alters the relationship of the numbers to the years of the cycle. It is necessary first to add 1, before dividing by 19, in order to obtain the position of the year in the cycle. On the other hand, this differential simplifies the formula for calculating the epact, as we shall see in Ch. 6.

2. THE INDICTION

The second column has the heading 'Indictions' and contains a numeral from 1 to 15. The Indiction is a 15-year cycle with a base-date corresponding to 1 September AD 312 (see Ch. 2). Dionysius numbers his year 532 as the 10th of an Indiction. The year 538 is the 1st year of an Indiction, which corresponds cyclically with the base-date in 312/13. In the Alexandrian calculations, the indictional year was synchronized with the year as numbered from Diocletian and with the beginning of the civil year on 1 Thoth = 29 August. These years are already in progress when a Roman year begins on 1 January. All the calendar dates in an Easter table are in March or April. We therefore have no way of knowing whether Dionysius understood his years of the Lord as being calibrated to the Roman calendar beginning in January or as being synchronized with the indictional years with which they are aligned in the tables.

The decree of the emperor Justinian (*Novella* 47; see Ch. 2), which made the inclusion of the Indiction mandatory in official documents, did not become effective until 537, more than a decade after Dionysius completed his work. He included this column primarily because it was present in his Alexandrian exemplar. C. W. Jones (1943: 384) maintained that the first indisputable use of an indictional date by a Latin writer is that of Dionysius Exiguus in the letter to Petronius.

As we shall see in Ch. 9, indictional dates for the purposes of an Easter table first appear in the 30-year list of Paschal full moons compiled by the eastern bishops on the occasion of the Council at Sardica in 343. That is also the first appearance of the indictional year in a document from outside of Egypt.

In commenting on this column in the Easter tables of Dionysius Exiguus, Bede suggested (*DTR* 48) that the Romans established the indictional year in order to avoid ambiguity in dating by regnal years. This explanation for the origin of indictional chronology as a sort of international year is incorrect, but it may well have been the reason for the use of the Indiction in the document from Sardica. The list of Easter dates prepared in that document was intended for empire-wide use. Therefore, the dates would need to be expressed by reference to an empire-wide standard that transcended the many local calendars with their varying methods of intercalation and their different seasons for starting a new year. The Roman consular year could have served such a purpose. It is, however, more convenient to number such a list. The imperial administration had recently established a new fiscal year beginning in September, with only minor local variation. It therefore perhaps seemed appropriate to the bishops who brought the list to Sardica to use this new indictional year.

3. THE EPACT

The epact—a Greek word meaning 'addition'—gives the age of the moon in days as of some fixed date. In Latin, the epact of the moon is often expressed as *luna* (moon) with a numeral. In the letter to Petronius, for example, Dionysius states one of the rules as follows. 'If moon fourteen falls on a Saturday, Easter is observed on the next day, Sunday, moon fifteen.' I shall use this notation as appropriate throughout this study.

The epact is the foundation of a Paschal table. Knowing the age of the moon as of a date certain, one can calculate the date of the first full moon on or after the vernal equinox. Because of the difference between the lunar year of 354 days and the solar year of 365 days, the epact advances by 11 from one year to the next. Leap years do not affect this differential. The 19-year cycle adds one day to the lunar year to match the additional day in a Julian leap year.

Since the average length of a lunation is 29½ days, the maximum epact is either 29 or 30. When the addition of 11 to the epact of the previous year results in a number greater than 30, one subtracts 30. Thus, the epact for the third year of a cycle is 22; and the epact for the next year is $22 + 11 = 33 - 30 = 3$. Some

Greek tables allow the epact to increase to 30.[1] Dionysius Exiguus subtracts 30 from that maximum and expresses the epact as 'none'. Theoretically, the epact $30 = 0$ represents the new moon at its conjunction with the sun. The epact of 1 represents the theoretical first visibility of the first crescent of the moon. It is from that point as day one that the fourteenth day of the moon is counted.

Over the course of a 19-year cycle, the epact will advance by $19 \times 11 = 209$ days, 1 day less than a multiple of 30. It is necessary therefore to add an additional day somewhere in the cycle. In the tables of Dionysius Exiguus, that addition occurs at the end of the cycle. The epact begins with 0 in the first year. In the last year, it has advanced to 18. In order to return to 0 in the first year of the next cycle, the epact must advance by 12 instead of 11. Thus the epact moves from 18 in the last year of the cycle to $30 = 0$ in the first year of the next cycle. Bede (*DTR* 42) discusses this anomaly under the heading *de saltu lunae*, 'concerning the Leap of the Moon'. Modern scholars continue to refer to this feature of a Paschal table as the *saltus*, and I adopt that usage throughout this study. The term first appears in a text purporting to be a Latin translation of a preface to the Easter table of Cyril, written some time after AD 449.[2]

In Roman and later Byzantine Easter tables the lunar epact was expressed as of 1 January, sometimes 31 December, the preceding day (see Ch. 10). Dionysius Exiguus does not indicate the date of the epact in his tables, either in the heading of the column or in the prefatory letter. By inspection one can determine that the tables give the epact of the moon as of 22 March or some lunar equivalent. In the second year of the cycle, for example, Dionysius has epact 11 and a Paschal 14th moon on 25 March. Thus, the date for epact 11 must have corresponded to 22 March. Bede explains (*DTR* 50) that 22 March was chosen for the epact, because this is the earliest permissible date for Easter.

This choice of date derives from the Alexandrian tradition. Eusebius (*HE* 7. 32) quotes Anatolius, the author of the earliest 19-year Paschal cycle, as stating that the cycle begins with the new moon of the first month, corresponding to 26 Phamenoth in the Alexandrian calendar and 22 March in the Roman calendar (see Ch. 8). The Index to the Paschal letters of Athanasius, composed in Alexandria some time after his death in 373, gives for each year the epact, the date of Easter, and the age of the moon on Easter Sunday (see Ch. 9). In most instances, the numbers agree with the cycle of Dionysius Exiguus. It is therefore to the Alexandrian calendar that we should look for an explanation of the seat of the epact at some date that is the lunar equivalent of 26 Phamenoth = 22 March.

[1] *Chronicon Paschale*, following p. 534; see Ch. 12.
[2] Krusch 1880: 341; Jones 1943: 41; see Ch. 10.

Joannes van der Hagen (1733: 202–4) argued that all the parameters in the cycle of Dionysius Exiguus should be explained by reference to the Alexandrian civil calendar. He calculated 26 Phamenoth as the lunar equivalent of the next to the last epagomenal day, 27 August, at the end of the previous civil year. He did not explain why that date should be an appropriate choice.

According to van der Hagen, the first year of the classical Alexandrian cycle as Dionysius knew it began on the first day of Thoth with a lunar epact of 2 on that date. F. K. Ginzel (1906–14: iii. 135), representing what is now the consensus among scholars, states that the cycle was calibrated such as to begin with the new moon of 1 Thoth, with epact 1. Since the first year of the cycle has epact $30 = 0$, the seat of the epact must on this view have corresponded to the last epagomenal day.

Both calculations are correct. As Eduard Schwartz (1905: 11–12) pointed out, the correspondence of the epact between 26 Phamenoth and the epagomenal days of the preceding year depends on where in the calendar the lunar new year begins and how therefore the alternation between full (30-day) and hollow (29-day) months affects the date of the new moon. Schwartz found van der Hagen's effort to explain all the parameters by reference to the Alexandrian civil year inappropriate. In his view, the Alexandrian 19-year cycle was developed only for the purpose of Easter calculations. Therefore the seat of the epact is really (*wirklich*) 26 Phamenoth and it is pointless to try to calculate the new moon of 1 Thoth. Such foolishness (*Spielerei*) was the invention of medieval European computists and has nothing to do with the foundations of the Alexandrian cycle.

Schwartz is right about the arithmetic, but he goes too far in denying to early Alexandrian computists any interest in the civil year. As we shall see in Ch. 6, at least one of the computistical rules that Dionysius says he adapted from 'Egyptian science' depends on a count of the days originally numbered from 1 Thoth.

A passage from St Maximus the Confessor supports the view that the Alexandrian epact was considered the lunar equivalent of the last epagomenal day. Maximus wrote a tract on Easter calculations in the year he designates as the 14th of an Indiction and the 31st of the emperor Heraclius—that is, AD 640/1 (*PG* 19. 1234). According to Maximus, 'the epacts of the moon are regularized in two ways: that is, up to the 31st of the month of March and up to the 28th of August' (*PG* 19. 1272).

The 31st of March is the lunar equivalent of 1 January, so that the epact as of that date is Maximus' version of the standard Roman and Byzantine definition of the epact. The 28th of August corresponds to the last day of the Alexandrian civil year. What we learn from Maximus therefore is that just as 31 December or 1 January was the most logical position for the epact in the Roman calendar, so also the Alexandrian epact was defined as of the beginning of the civil year. According to Maximus, the seat of the epact was actually the last day before 1 Thoth, just as in some cycles based on the Roman calendar the epact was numbered from 31 December. The cycle used by the author of the *Chronicon Paschale* (following p. 534) defines the epact as of 31 December, as does the 19-year cycle devised for the Gregorian calendar.[3]

The work of Otto Neugebauer (1979*a*) on the Ethiopic Paschal cycle has given us another representative of the classical Alexandrian cycle, in addition to the cycle of Dionysius Exiguus. Ethiopian Christianity derives from Alexandria, and the Ethiopic tables use a version of the Alexandrian calendar. The Ethiopic tables exhibit the same sequence of epacts (*ảbaqtē*) as in the tables of Dionysius, with the same base-date corresponding to the first year of Diocletian. The Ethiopic tables are far more complex than those of Dionysius and show that computistical exercises were not the exclusive province of Europeans. The epact is used to calculate the date of the Jewish lunar new year (*maṭqeʿe*) at the approximate time of the autumnal equinox and the dates for Yom Kippur and the Feast of Tabernacles, as well as the 14th day of the Passover moon.

By inspection of the relationship between *ảbaqtē* and *maṭqeʿe*, between epact and lunar new year, one will find that the epact corresponds to the last epagomenal day of the preceding year—that is, to the day before 1 Thoth. Thus, in the sixteenth year of a cycle *ảbaqtē* and *maṭqeʿe* are both 15 (Neugebauer 1979*a*: 59–62). Except in embolismic years, the last month of a lunar year is hollow, consisting of 29 days. The moon of *maṭqeʿe* is by definition 1 (Neugebauer 1979*a*: 48, 190). If *maṭqeʿe* is on 15 Thoth and counts as the first day of the moon, then the epact for that date is equivalent to $29+1=30$. The difference between 30 and the epact of 15 for that year is 15. Therefore the seat of the epact must be 15 Thoth minus 15 days—that is, the last day before 1 Thoth. In the 17th year, *ảbaqtē* is 26 and *maṭqeʿe* is 4. The Jewish lunar year is on the fourth day of Phaophi. Since the date has advanced from 15 Thoth to 4 Phaophi, the year is embolismic. An embolismic month has 30 days. Therefore the moon of 4 Thoth was also 1. The preceding month was hollow, so 3 Thoth has moon 29. Since *ảbaqtē* is 26, it follows again that the epact is defined as of the last epagomenal day.

In the first year of the cycle as the Ethiopic tables present it, the epact is 30=0 and the Jewish lunar new year is 30 Thoth. The lunar month beginning 1 Thoth in that year therefore has only 29 days. It follows that the 19-year cycle, at least in its fully developed classical form, begins neither with the new moon

[3] Holford-Strevens 1999: 817–20.

of 26 Phamenoth, as Schwartz maintained, nor with the new moon of 1 Thoth, as Ginzel claimed, but with the Jewish lunar new year on 30 Thoth.

As I shall argue in Chs. 7 and 8, the earliest forms of the Alexandrian cycle were not based on a theoretical lunar calendar, but on an average lunation of 29½ days and a sequence of epacts that returns to its start after 8 or 19 years. The formulae for determining the date of the Paschal full moon and for calculating the age of the moon on any day in the year are based not on the lunar calendar of the 19-year cycle, but on the Alexandrian civil year.

The advantage of defining the epact as of the last day of the previous year, rather than the first day of the current year, is that it facilitates the formula for calculating the lunar epact as of any date in the civil calendar. If one knows the epact of the year, one can determine the age of the moon as of any given date by counting the number of days elapsed since the beginning of the year, adding that number to the epact, subtracting the nearest lesser multiple of 30, and adding half of a day for each month since the beginning of the year. The calculations are especially straightforward in the Alexandrian calendar with its 12 equal months of 30 days, plus 5 extra days at the end, 6 for a leap year.

As an example, let us assume that the epact for the year is 1, as of the last epagomenal day. We want to determine the epact for the 26th day of Phamenoth. Phamenoth is the seventh month. The 26th day is therefore 206 days after the last epagomenal day of the previous year. If the epact for the year is 1, then the epact for 26 Phamenoth is approximately $1 + 206 = 207 - 180 = 27$. The formula assumes a lunation of 30 days, instead of 29½. To correct for this differential, we must add one-half day for each calendar month. On the 26th day of the seventh month, the accumulation is 3½ days, so that the age of the moon on 26 Phamenoth is 30½ days, which is one day more than an average lunation. Thus the age of the moon on 26 Phamenoth is 1 day, and this date serves as the lunar equivalent of the last epagomenal day of the preceding year. As we shall see in the next chapter, Dionysius Exiguus uses an adaptation of this formula.

The epact (e) can be regarded as the equivalent of the age of the moon on 26 Phamenoth for the purpose of calculating the calendar date of the Paschal full moon. One adds to 26 Phamenoth the difference between 14 and e for $e < 15$, between 44 and e for $e > 14$. The last epagomenal day is the seat of the epact for the purpose of calculating the age of the moon for any date in the calendar. Whether that calculation produces the same number as one would obtain by counting the days of the civil calendar from the lunar new year in any given year of the cycle depends on where the lunar new year appears in that year and how therefore the alternation of full and hollow months affects the count.

It is worth repeating that Dionysius does not himself define the seat of the epact. Those who used his tables discovered empirically that the epact could be considered as the equivalent of the age of the moon on 22 March. They had no interest in the Alexandrian calendar.

4. THE CONCURRENT

A table of new moons is useless for the purpose of determining the date of Easter Sunday unless one also knows what dates in the year will be a Sunday. In later medieval and modern Easter tables, each year is designated by a 'Dominical Letter'—Lord's-Day Letter or Sunday Letter (Ginzel 1906–14: iii. 125–34). This is a letter from A to G (1–7), indicating on what day in January the first Sunday occurs. Thus a year with Dominical Letter C has its first Sunday on 3 January. For a leap year, there are two such letters. After 1 March in a leap year, what began as a C year behaves as if it were a B year. Because the solar year exceeds an even number of weeks by one, the Dominical Letter is reduced by one in each successive year, with an additional reduction in leap years.

This cumbersome system is a relic of a Roman calendrical practice that long predates the much simpler device that we find in the Easter table of Dionysius Exiguus and its Alexandrian predecessors. The only surviving representative of the Roman calendar before the reforms of Julius Caesar are fragments of the 'Calendar of Antium', a monumental calendar dating from the early first century BC and originally standing some eight feet high and a little less than four feet wide (Hannah 2005: 102–6). In this calendar, the days are lettered in a repeating series, A–H, beginning with A on 1 January. These letters represent a Roman 'week' of eight days, known as the *nundinae* or 'ninth-day cycle', because the Romans supposedly held a market every ninth day, inclusively counted.

The seven-day week seems to have been adopted during the Augustan period, with Saturday originally being the first day of the week. One of the earliest references comes from the poet Tibullus (1. 3. 18), who refers to 'Saturn's sacred day'. The historian Cassius Dio (37. 18–19), attributes the planetary names of the days to the Egyptians. He gives the order of the planets as Saturn, Jupiter, Mars, Sun, Venus, Mercury, Moon, which represents the seven planets in the order of their apparent distance from the earth, with Saturn the outermost. He explains why the days of the week begin from Saturday and then proceed to Sunday, Monday, and so forth. There are 24 hours in a day. If you assign a planet to each hour, beginning with Saturn, you will find that Saturn again governs the 22nd hour, so that it is the Sun that governs the first hour of the next day. The conservatism of calendrical practice is such that the Christian author of the *Chronograph of 354* still refers in places to a week beginning with Saturday (Salzman 1990: 30–1). Such cultural conservatism accounts for the fact that the Alexandrian numbering of the weekdays that we find in the tables of Dionysius Exiguus was replaced in later medieval versions by the lettered 'Dominical Days'.

In the fourth column of the Dionysian table, under the title 'concurrent days', there is a numeral from 1 to 7, corresponding to the days of the week, with Sunday numbered as 1. The numbered day of the week is sometimes referred to by the Latin term 'feria'. *Feriae* literally means 'holiday', but *feria* came to be the Latin term for the day of the week. The word first appears in that sense in Tertullian's essay 'On Fasting' (*de ieiunio adversus psychicos* 2. 3). What Dionysius calls the concurrent, Greek authors often refer to as the solar epact (Maximus, *PG* 19. 1241). Dionysius uses that term in his fourth *argumentum* (see Ch. 6).

Unlike the Dominical Letters, which retreat each year, the concurrent advances by 1 each year and by 2 in leap years. Thus the concurrent indicates not the date of the first Sunday in the year, but a parameter that corresponds to the numbered day of the week by one calendrical convention or another. Nothing in the tables or in the appended *argumenta* indicates to what calendrical convention the concurrent refers. We might expect the day of the week to be given for the same day as the epact of the moon, 26 Phamenoth = 22 March. In fact, examination of the Easter dates in the tables shows the concurrent corresponds to the weekday of 28 Phamenoth = 24 March or some date sharing the same feria. In the 16th year of the table, for example, AD 547, Easter Sunday is 24 March, and the concurrent for the year is 1.

Scholars have puzzled since the time of Bede about the choice of 28 Phamenoth = 24 March. This was chosen, says Bede (*DTR* 53. 10–14), 'because that date is close to the beginning of the Paschal festival, so that the weekday of the epact or of the 14th moon becomes patent and there is a clear path to finding the day of the Paschal Sunday'.

Consistent with his general theory, van der Hagen (1733: 207) suggested a connection with the Alexandrian new year on 1 Thoth. He correctly noted that 28 Phamenoth shares the same weekday as the antepenultimate day of the preceding year, but did not explain why that fact should be significant. Franz Rühl (1897: 142–5, 158–60) connected the concurrent with the solar additions of the Byzantine 28-year solar cycle, which began with 1 on 1 October, designating a Monday. The original seat of the concurrent was not 24 March, in his view, but 1 October. The number indicated how many days must be added to Sunday to find the day of the week. Unconvinced by that or any other hypothesis, Bartholomew Mac Carthy remarked (1901: xxix) that this 'insuperable objection still awaits satisfactory solution'.

Jones (1943: 387) thought he had found that satisfactory solution. The seat of the concurrent was not 24 March, as Bede thought, but 24 February. Jones explains that because the extra day of leap year was intercalated into the Roman calendar on 24 February, as a second sixth day before the Kalends of March, that date would be the appropriate one at which to fix the concurrent of the year. Against this explanation, one can object that the choice of 24 February does not fit the Roman practice. The consular list in the *Chronograph of 354*, for example, gives the age of the moon and the weekday for the same date—1 January (Mommsen 1892: 50–61). The definition of the concurrent as referring to the weekday of 24 March is simply the empirical discovery of someone using the Dionysian tables.

In principle, van der Hagen was right. Like the lunar epact, the solar epact derives from an Alexandrian usage. For the days of the week, the Athanasian Index has a parameter labelled 'of the gods', which is a reference to the pagan names of the weekdays. Thus, for the year corresponding to 338, we find Indiction 11, epact 15, gods 6. In the year 338, 24 March was indeed a Friday, the sixth day of the week. Thus the parameter in the Athanasian Index is the same as in the tables of Dionysius.

This same weekday parameter appears also in the Ethiopic tables, under the heading *ṭentyon*, which is a slightly corrupted transliteration of the Greek *tôn theôn*, 'of the gods'. It has the same value as the weekday parameter in the Athanasian Index. That is, it gives the weekday for some equivalent of 28 Phamenoth. In an adjacent column is a different weekday parameter, under the heading 'Day of John'. This is a reference to the feast of the martyrdom of John the Baptist, which was (and is) observed on 29 August = 1 Thoth. The parameter J gives the weekday of 1 Thoth, with Sunday counted as 1. J is always either 4 greater or 3 less than T.

Otto Neugebauer found an explanation in the work of Abū Shaqr, an Arabic-speaking Coptic Christian, who lived in Cairo in the middle of the thirteenth century. Abū Shaqr wrote a commentary on the various chronological systems then in use. The work survives only in an Ethiopic translation. According to Neugebauer (1979*a*: 218–20; 1988: 29), Abū Shaqr informs his readers that the column in the 532-year tables indicating the day of the week is for the Copts the weekday of 1 Thoth, counted from Wednesday as 1, and for the Syrians it is the weekday of 1 Tishri (1 October), counted from Sunday as 1.

Neugebauer says that he can find no 'textual evidence that would motivate the counting of Wednesday as t = 1'. He suggests two possibilities. First, the choice is perhaps related to the Alexandrian era of the Incarnation as established by Annianus, on 25 March of the Alexandrian year corresponding to AD 8–9, in which year 1 Thoth was a Wednesday. That explanation is unsatisfactory. It traces the matter back only to the time of Annianus, about 400, rather than to the first appearance of this parameter in the Athanasian Index a few years earlier. Neugebauer's other suggestion is that Wednesday was counted as day 1 of the cycle of the sun, because it was on the fourth day of the first week that God created the sun and the moon. There is precedent for a calendar beginning with Wednesday in the 364-day calendar of the Dead Sea Scrolls. The days of the week were nevertheless numbered from Sunday as 1.[4]

Abū Shaqr was probably as puzzled by this parameter as was Bartholomew Mac Carthy 700 years after him. His explanation, like that of Bede, is simply an empirical discovery. To say that that this parameter corresponds to the weekday of 1 Thoth with Wednesday numbered as 1 is the equivalent of van der Hagen's observation that the parameter corresponds to the third day before 1 Thoth with Sunday counted as 1. Especially for an Easter table, a numbering of the days of the week with some day other than Sunday counted as 1 greatly compromises the usefulness of the device.

Van der Hagen was right to seek an explanation in the Alexandrian calendar and to note the correspondence between 24 March = 28 Phamenoth and the antepenultimate day of the previous calendar year. An explanation for the choice of this date can be found in the weekday formula of Paul of Alexandria, who wrote an introduction to astrology in AD 378. Van der Hagen referred to the passage, but without explaining its significance.

Paul presents a formula for finding the 'day of the gods', using as an example what he calls the present day, the 20th day of Mechir in the year of Diocletian 94 (pp. 39–41 Boer). That date corresponds to 14 February AD 378. Thus, this text is approximately contemporaneous with the Athanasian Index.

First, Paul calculates the weekday parameter that defines the year. 'Take the number of the year of Diocletian, add to it one-quarter of the number, then add the constant 2. Divide by 7. The remainder is the parameter for the year.'

An ordinary year has 365 days, one day more than a whole number of weeks. Every fourth year, leap day adds an additional day. The formula $D + \frac{1}{4}D$ tells us how many days to add to a weekday number representing some starting point. That number is the constant of 2. For the year $D = 94$, the formula yields $94 + (\lfloor 94/4 \rfloor = 23) + 2 = 119$. The number 119 divided by 7 is 16 with a remainder of 7. Therefore, the parameter 'of the gods' for the year 94 is 7, Saturday. In the 532-year table of Bede, the year equivalent to $D = 94 =$ AD 378 has the concurrent 7. Clearly, then, Paul is using the same weekday parameter as did the Alexandrian Easter tables that were transmitted through Dionysius Exiguus to Bede.

4 Beckwith 1996: 93–124; Vanderkam 1998.

To find the weekday for any given date, Paul continues, take twice the number of the month counted from Thoth as 1, add the number of the day within the month, add the parameter for the year, and divide by 7. The remainder is the number of the day counted from Sunday as 1. Mechir is the sixth month. So take 12, add 20, add 7 to yield 39. Divide by 7. The remainder is 4. So 20 Mechir 94 is a Wednesday. That date—20 Mechir, 14 February in the Roman calendar—was indeed a Wednesday in AD 378.

This formula works because every Alexandrian month has 30 days—two days more than a multiple of 7. A fixed day in the month will advance by two weekdays each month. Thus, if 1 Thoth is a Sunday, 1 Phaophi will be a Tuesday, 1 Hathyr a Thursday, and so on. Therefore twice the number of the month plus the number of the day tells us how many days to add to the weekday parameter for the year. For the first day of the first month (Thoth), the formula requires the addition of $2 + 1 = 3$ to the parameter for the year. Therefore, the parameter for the year must correspond to the weekday of the third epagomenal day as counted backwards from 1 Thoth. That day is in fact the weekday equivalent of 28 Phamenoth = 24 March, as we can see by working the formula. Let us suppose that the concurrent for the year is 6, Friday. Phamenoth is the 7th month. So we have the formula $14+28+6=48$. The number 48 is divisible by 7 with a remainder of 6. Therefore 28 Phamenoth has the same weekday as the parameter for the year.

Otto Neugebauer, in a commentary on this passage (1958: 135), offers an explanation for the constant of 2. In his view, one is actually calculating from a date corresponding to one year, one 30-day month, and 1 day before 1 Thoth of 1 Diocletian—that is, year –1, month 12, day 6, equivalent to 6 Mesore = 30 July AD 283. The 6th day of Mesore was a Monday in the year D = –1, hence the parameter of 2. From that point to 1 Thoth in 1 Diocletian, one adds 1 for the year, 2×1 for the month, and 1 for the day, for a total of 4. With the constant of 2, the total is 6, so 1 Thoth in 1 Diocletian is a Friday.

Neugebauer's explanation is arithmetically correct, but irrelevant. The constant of 2 is simply the number that must be added to the formula to produce the correct result. Paul or whoever generated this formula probably determined empirically that the constant to be added must be 2, without worrying about the actual weekday of a theoretical starting point. In effect, 2 is the weekday parameter for the year preceding 1 Diocletian.

The formula $2M + D$, which equals 3 on the first day of Thoth, explains why the parameter for the year must correspond to the numbered weekday of the third day before the beginning of the year. The inventors of the Alexandrian Easter tables adopted a weekday formula that is peculiar to the Alexandrian calendar. The formula allows one easily to determine the weekday on which the 14th day of the moon falls. Easter will be the next Sunday. What appears almost nonsensical for the Roman calendar, is straightforward in the Alexandrian calendar.

That the antepenultimate day of the year is epagomenal day 3 in common years, epagomenal day 4 when a leap day is added, vitiates neither the formula nor my theory about the rationale for the definition of the concurrent. One is defining the weekday parameter for use in a formula, not the weekday of a specific calendar date.

5. THE CIRCLE OF THE MOON

In the fifth column, Dionysius gives a number from 1 to 19 indicating the year in what he calls the 'circle of the moon (*lunae circulus*)'. The numbers begin with 17 and end with 16. That is, the first year of a circuit of the moon coincides with the fourth year of the tables, the fourth year of what Dionysius calls the *cyclus decemnovennalis*. The column is completely superfluous and has no role in the calculation of epact, concurrent, 14th moon, or Easter Sunday. In the heading to the table, Dionysius says it is important to know 'what year it is of the circle of the moon', as well as 'what year of the 19-year period'. The rules that he appended to the table explain how to calculate the year within the circle of the moon, but none of his rules uses that parameter to calculate epact, concurrent, or anything else. Ideler (1825–6: ii. 237, 262) thought that the circle of the moon was an innovation of Dionysius Exiguus and that Dionysius had interpolated it into the last cycle of the Cyrillan table that he reproduced. Yet Dionysius is explicit in the letter to Petronius that he made no changes in the Cyrillan cycle except to number the years from Christ, instead of from Diocletian. There is no reason to accuse Dionysius of yet another lie in this matter. This alternate circle of the moon must have been contained already in his Alexandrian exemplar.

i. Bede's Explanation

According to Bede, the lunar circle 'pertains to the month of January'. 'Just as every year of the 19-year cycle begins and ends with the Paschal month because of the observation prescribed in the Law of the Jews, so likewise this year, as instituted by the Romans, begins with the moon of January and ends there.'[5] In

[5] Bede, *DTR* 56; translation Wallis 1999: 139.

the rest of the chapter, Bede discusses the difference between common and embolismic years and concludes with a table giving the length of the lunar year for each year, beginning with year 1 of the lunar circuit, year 4 of the *cyclus decemnovennalis*. In year 1, the lunar year begins on 1 January and continues for 354 days to 20 December. The second year has 354 days from 21 December to 9 December. The third year, since it is embolismic, has 384 days from 10 December to 28 December. Bede continues until in the 19th year, which is the third of the *cyclus decemnovennalis*, the lunar year of 384 days ends on 31 December.

Bede seems to be saying that in the fourth year of the cycle, which is year 1 of the lunar circle, there is a new moon on 1 January, just as in the first year of the cycle there is a new moon with epact 0 on 22 March, representing the beginning of the first month in the Jewish calendar. Elsewhere, however, Bede gives two different rules for determining the age of the moon as of 1 January, both of which yield an epact of 12 for this year of the cycle.

The first rule appears in ch. 20 and calculates the age of the moon as of the first day of any Roman month in any year of the cycle. The rule is based on determining what he calls the 'regular' for each month in the first year of the cycle and then adding the epact for the year in question. Thus, in the first year of the cycle the epact is 0 for 22 March. The number of days elapsed since 1 January is $31 + 28 + 21 = 80$. Subtract $29.5 \times 2 = 59$ and the remainder is 21. Subtract 21 from $0 = 30$ and the result is 9. Therefore the moon is 9 days old on 1 January in the first year of the cycle and the regular for January is 9. By that rule, the age of the moon on 1 January in the fourth year of the *decemnovennalis* (first year of the lunar circle) is 12, because the epact for that year is 3.

In ch. 57, Bede gives a rule for determining the age of the moon on 1 January in any year of the lunar circle. Here he states that the 'regular' is 1. For any given year of the lunar circle, one multiplies the number of the year by 11, adds the regular, and divides the result by 30. The remainder is the age of the moon on 1 January in that year of the lunar circle.

Bede does not explain how he determined that the regular for this formula is 1. His reasoning was, perhaps, as follows. The epact advances by 11 in each successive year of the cycle. Therefore one can calculate the epact by multiplying the number of the year by 11, then adding a constant to adjust for the epact at the year 1. We already know from the formula in ch. 20 that the moon has an age of 12 on 1 January in the first year of the lunar circle. Therefore, the differential between the epact of year 1 and the first multiple of 11 is 1. Bede calls 1 the 'regular' for this formula, but he does not call it the 'regular for January'. Strictly speaking, then, the 'regular' is not a number designating the age of the moon as of the 1st day of a month, but the constant to be applied in a formula.

In ch. 56, Bede temporarily forgot the correct definition of the 'regular'. Since the regular for calculating the age of the moon as of 1 January in any year of the lunar circle is 1, Bede wrongly supposed that the epact of the moon for 1 January in the first year is 1.

Most modern scholars take an entirely different approach and see in this alternate circle of the moon a cross-reference to some other kind of Paschal calculation—one that used the 19-year cycle, but with a different base-date. Denis Petau (1703, book 6, ch. 5) thought that this column gave a correspondence with an older *decemnovennalis* in use at Rome. There is, however, no evidence for such a cycle among the Romans (see Ch. 11).

ii. The Jewish Cycle

Ludwig Ideler believed that Dionysius Exiguus had interpolated this column into the Alexandrian table as a reference to a 19-year cycle in use among the Jews. Agreeing at least in part with Ideler, Ginzel (1906–14: iii. 137) stated that the numbering of the 'lunar circle' refers to the 19-year cycle of the Jews and the Byzantines. More recently, both August Strobel (1977: 430–40) and Otto Neugebauer (1979*b*) have subscribed to the idea that third-century Christian computists learned of the 19-year cycle from the Jewish community either of Alexandria or of Antioch. The Jews in turn learned of the cycle from the Babylonians.

It is true that the year 1 of the Jewish era of creation corresponds to the year 1 of Dionysius' circle of the moon and that the later medieval and modern Rabbinical calendar employs a 19-year cycle. There is, however, no evidence that either the Jewish era of creation or the Jewish 19-year cycle existed early enough to have influenced the Christian calculations.

The earliest references to Jewish calculations based on a 19-year cycle appear in the work of the Persian mathematician and chronologist Al-Biruni, writing in the year 1311 of the Seleucid era, AD 999/1000 (ch. 7: 141–7). The full set of rules first appears, under the title 'Sanctification of the Moon', in the *Mishneh Torah* of the famous Spanish Rabbi, Moses ben Maimon—Maimonides. Maimonides (11. 16) designates as the present year the 17th of a cycle, the year 1489 of the Seleucid era, 4938 since creation, 1009 from the destruction of the temple—that is, the year AD 1177/8. If the year 1489 of the Seleucid era was the year 4938 since creation, then the Seleucid year 1 was the year 3450 of the world. The Seleucid year 1 corresponds to 312/11 BC. The year 1 of the world is therefore 3761/0 BC. That date corresponds to the fourth year of the 19-year cycle of Dionysius Exiguus. Maimonides also says that the Seleucid year 1489, corresponding to AD 1177/8, was the 17th year of a cycle. The first year was therefore 1161/2, which corresponds on a 19-year cycle to AD 534/5, again the fourth year of Dionysius' cycle.

For Maimonides, there is an interval of 3449 years between the Seleucid era and the era of creation. Al-Biruni says that there is a difference of 3448 years between the Seleucid era and the Jewish 'era of Adam'. That interval yields a date for creation in 3760/59 BC, one year later than the date of Maimonides. These two dates have come to be known as the 'Palestinian' and the 'Babylonian' epochs of creation. Schwartz (1905: 160–1) suggested that the difference may be no more than that between the two traditions associating creation with the month of Nisan in the spring or the month of Tishri in the fall.

Tradition attributes the establishment of the fixed Jewish calendar to Rabbi Hillel ben Yehuda in the year 670 of the Seleucid era, AD 358/9. There is, however, no evidence in Talmudic sources for the use of a 19-year cycle as early as the fourth century. The tradition about Hillel is not itself first attested until the eleventh or twelfth century, in the work of Abraham Bar Hiyya Savasorda of Barcelona (*c.*1065–1136). Bar Hiyya cites Rav Hai Gaon (*c.*969–1038) for this information.[6] Maimonides (5. 3) does not mention Hillel, but he dates the beginnings of a calculated calendar to about the middle of the fourth century.

The earliest explicit reference to a 19-year cycle dates from the eighth century, in the text known as the *Pirkei Rabbi Eliezer*.[7] The earliest evidence for a calculated date for creation approximating that of Maimonides appears in the Babylonian Talmud. In the tractate *Abodah Zara* (9b) Rav Hanina is quoted as stating that the year 4231 from creation is three years longer than an interval of 400 years since the destruction of the temple. The Romans destroyed the temple in AD 70. If AD 470 corresponds to the year of the world 4228, then the year 1 was 3758 BC. How long after 470 the text was written we do not know. Even if this date for creation was calculated in the fifth century or earlier, it does not follow that the 19-year cycle also dates from that time. One can try to use the data in the Bible to calculate a date for creation independently of any interest in calculating dates for the new moon.

The next reference to this approximate date for creation appears in the *Baraita d'Shemuel*. The author says that in the year 4536 the sun and the moon, sabbatical years and equinoxes, all coincided on a Tuesday evening in the month of Tishri.[8] The data fit the new moon of 17 September AD 776, implying a date for creation in 3760 BC. The earliest clearly datable reference

6 *Sefer ha-Ibbur*, p. 97 Filipowski; see Stern 2001: 175–6.
7 p. 57 Friedlander; see Stern 2001: 196–200.
8 Text, translation, and commentary Stern 1996: 118–25.

to such an epoch appears in a letter of the Babylonian Exilarch, which was discovered among the manuscripts of the Genizeh collection in Cairo and first published in 1922.[9] The document discusses calendar problems for the year 1147 of the Seleucid era, 4595 from creation. The year 1147 of the Seleucid era corresponds to AD 835/36, implying again a year 1 corresponding to 3760 BC, in agreement with Al-Biruni.

Whatever innovation it was that Hillel II introduced into the Jewish calendar, it was not the 19-year cycle with a base-date corresponding to 3761 BC. No such Jewish cycle was in existence early enough for either Dionysius Exiguus or Cyril of Alexandria to have based the circle of the moon upon it. Furthermore, quite apart from any question of its antiquity, the Jewish 19-year cycle as we know it from Maimonides would have been a poor model for the Alexandrian cycle.

The Christian 19-year cycle is based on the annual differential of 11 days in the epact. With the adjustment known as the 'leap of the moon', it produces a cycle that returns the phases of the moon to the same calendar date every 19 years and a Paschal period that repeats the weekdays every 532 years. The result in the Julian calendar is a perpetual 532-year cycle. There is no such periodicity in the Jewish 19-year cycle. The objective is to calculate the new moon (molad) that defines Rosh Hashanah—the first day of the month of Tishri, the seventh month in the religious calendar, the first month in the civil calendar. From this 'molad of Tishri' one determines the dates for such festivals as Yom Kippur and Passover.

To calculate the molad of Tishri, one counts the number of lunar months that have elapsed since a theoretical molad of creation, which Maimonides defines (6. 8) as having occurred on day 2, at 5 hours and 204 parts. The 'parts' are fractions of an hour divided by 1080. The actual base-date for the calculation is a notional day 0, beginning at time 0 at the beginning of the previous Sabbath, the equivalent of 6.00 p.m. on a Friday evening.

The count of the number of months elapsed since creation is based on the equation between 235 lunar months and 19 solar years. One calculates the molad of Tishri for any numbered year in the Jewish calendar by subtracting 1 and dividing by 19. The resulting whole number is the number of complete 19-year cycles that have elapsed since creation. One multiplies that number by 235 to calculate the number of lunations that have occurred until the first year of the current 19-year cycle. The remainder of the division by 19 is the number of years from the beginning of the cycle to the year in question. One has to count the number of lunations based on knowledge of which years of the cycle are common, with twelve lunations, and which embolismic, with

[9] Mann 1920–2, ii. 41–2; Stern 2001: 270–5.

thirteen lunations. Maimonides says (6. 11) that the embolismic years are 3, 6, 8, 11, 14, 17, 19. One then multiplies the total number of lunations that have occurred since the base-date by the average length of a lunation, which Maimonides defines (6. 5) as 29 days, 6 hours, 793 parts. To the result, one must add the 2 days, 5 hours, 204 parts of the first molad.

Maimonides says (11. 16, 12. 4) that the epoch on which he based his calculation was at the beginning of the evening of Thursday, the third day of Nisan in the year 4938 from creation, 1489 of the Seleucid era, when the sun was in the constellation of Aries at 7 degrees, 3 minutes, 32 seconds. From this data it is possible to calculate that the Julian date of the epoch was the molad of Wednesday, 22 March AD 1178, at 6.00 p.m., and that the molad of creation was on Monday, 7 October, shortly before midnight, 3761 BC.

To illustrate, we can calculate the molad of Tishri for the year that began in the autumn of 5767 (AD 2006), converting hours and parts to a decimal expression. The year 5767 is the 10th year of the 19-year cycle that began in the year 5758. There are 303 full 19-year cycles for a total of 71,205 lunations. To these we add for the 9 completed years of the current cycle 6 ordinary years of 12 months and 3 embolismic years of 13 months for a total of 71,316 lunar months.

At an average of 29.53059414 days per lunation, 2,106,003.85139 days have elapsed since the base-date. To this we add the 2.21620 days of the first molad, for a grand total of 2,106,006.06759 days. There are rules restricting the date, depending on the time of day of the molad and the day of the week. The total of 2,106,006 is divisible by 7 with a remainder of 0, so the molad will fall on weekday $0 = 7$, the Sabbath, at about 1 hour, 37 minutes, which is not one of the times or weekdays to which a special rule applies. Rosh Hashanah will therefore be on a Saturday.

To determine the date in the Julian calendar, we need to divide the number of days that have elapsed by 365¼. Dividing 2,106,006 by 365.25, we find that the interval is short of 5766 whole years by about 25½ days. Therefore, 1 Tishri 5766 should be about 26 days earlier than the molad of creation on 7 October, or approximately 11 September. The day must be a Saturday, so the actual date is 10 September. As of 2006, the Julian calendar runs 13 days behind the Gregorian calendar, so the modern date for Rosh Hashanah is Saturday, 23 September 2006, or what the Roman calendar would designate as Friday, 22 September, about 7.37 p.m.

The rabbinical calculations proceed somewhat differently from this example. Either way, it is clear that the Jewish 19-year cycle is something entirely different from the system of epacts that Christians employed.

With the Jewish calculation, it is possible to produce a list of molads, but not a repeating cycle. Each molad of Tishri must be calculated independently either from the base-date or from a known molad in the more recent past. The average lunation of 29.53059414 is very close to the long-term astronomical mean of 29.53058889, and precisely for that reason it cannot produce a repeating cycle. As Maimonides points out (6. 10), after 19 years the molad of Tishri falls short of the Julian calendar year by 1 hour 485 parts.

The earliest evidence for a Jewish calendar possibly based on calculation, rather than observation, comes from the middle of the fourth century. The document from the eastern bishops at the Council of Sardica in 343 includes a list of sixteen dates for the 14th day of the Paschal moon according to a Jewish reckoning. The list covers the years corresponding to AD 328–43. The dates range from as early as 2 March to as late as 30 March. Schwartz first published the document in 1905. He believed that this list of dates is authentically Jewish and suggested (1905: 123–6) that they derived from the Jewish community in Antioch. V. Grumel (1958: 42–7) argued that the 'Jewish' list must have been based on a 19-year cycle and must have included a *saltus lunae* in order to return to its start in the 20th year. There is no such *saltus* in the list of 16 years, so it must have occurred in one of the other three years. The most likely candidate, for Grumel, is the 18th year of the list, corresponding to the first year of Dionysius' 'circle of the moon'. In that year of the cycle there would be a calculated new moon on 24 September, the approximate date of the autumnal equinox, and the approximate date of the new year both in the Jewish calendar and in some versions of the Macedonian calendar used in the eastern empire. Grumel agreed with Schwartz that the list derives from the Jewish community of Syria and suggested that they in turn had adapted it from the cycle of Anatolius. He believed that a similar recalibration of the cycle of Anatolius undertaken in Constantinople in the 350s produced the circle of the moon that we find in the Paschal tables of Dionysius Exiguus.

There is nothing in the text to support Grumel's claim that the Jewish dates were based on a 19-year cycle. Sacha Stern (2001: 75–80, 124–33) has argued, following Schwartz, that the dates contained in this document are based not on a lunisolar cycle, but on a rule restricting the Paschal full moon to the Roman month of March. The community from which it derives calculated the 11-day interval between lunations from one year to the next. They added 19, instead of subtracting 11, whenever the full moon would retreat into February. According to Stern, the Jewish calendar in this period varied from community to community and was based on a combination of actual observance of the first crescent of the moon and simple calculations like the 11- or 19-day intervals reflected in the Sardica text.

Ari Belenkiy (2002) has recently argued that the 'theory of others' mentioned in some Talmudic texts was a calculated calendar based on an 11-day system of epacts. He suggests that the Jews of Alexandria might have used such a system and even, perhaps, an 8-year cycle, before the Christian community adopted such methods. Belenkiy thinks that Hillel's innovation might have been the adoption of a 19-year cycle to improve the system of epacts. If Belenkiy is right, the Alexandrian Christians might have adopted the theory of the epacts from the Jewish community, but not a 19-year cycle. By the time of Hillel, a 19-year cycle had been use in Christian communities for almost a hundred years.

iii. The Byzantine Cycle

Jewish calculations are unlikely to have been the source either of the Alexandrian 19-year cycle or of the alternative circle of the moon. The prevailing view among scholars now is that this 'circle of the moon' with its first year corresponding to the fourth year of a Dionysian cycle serves as a cross-reference to the Byzantine cycle. That cycle has the same dates for the 14th day of the moon as Dionysius Exiguus, but it begins with a Paschal full moon on 2 April, corresponding to the first year of Dionysius' circle of the moon. Linked to this cycle is a Byzantine era of creation corresponding to 5509/8 BC.

Ferdinand Piper revived interest in the Byzantine calculations among European scholars in a short monograph published in 1858. Piper argued (1858: 117–20) that 'the circle of the moon' in the western tables deriving from Dionysius Exiguus is a reference to the Byzantine cycle with its base-date corresponding to 5509 BC. Although evidence for that cycle does not appear until the seventh century, Piper believed that its origins must be much earlier. Forty years later, Schwartz (1899: 2467–8) agreed, stating that the presence of the circle of the moon with its 16-year shift already in the Cyrillan tables that Dionysius continued shows that the origins of the Byzantine calculation go back at least to the fifth century. Serruys (1907*a*) and Ginzel (1906–14: iii. 137) both accepted that hypothesis. It has now become the standard view.[10]

It is by no means self-evident that this column was intended as a cross-reference to a Byzantine cycle for which there is no evidence until the seventh century. To take the appearance of this column in the Cyrillan table as evidence that the Byzantine cycle must have been established already by the middle of the fifth century is logically fallacious. Grumel (1958: 41–8, 73–84) rejected the assumption that Dionysius' circle of the moon presupposes either the Byzantine era of the world or the Byzantine cycle as we know it from later texts. He believed that this version of the 19-year cycle arose in a reform of the Alexandrian cycle that took place in Constantinople shortly before the year 353. His argument can be summarized as follows.

[10] Jones 1943: 388; Wallis 1999: 346; Holford-Strevens 1999: 810; Declercq 2002: 197–8.

Anatolius of Alexandria, who became bishop of Laodicea in Syria in the 260s or 270s, composed the first Christian 19-year cycle of Paschal moons (see Ch. 8). He drafted a 95-year list beginning in the year corresponding to AD 258 and ending in 352. No Greek or Latin source informs us what provisions were made to extend this list forward beyond its terminus. From Armenian sources we learn that Andreas of Byzantium composed a 200-year list of Paschal moons that began in 353 (see Ch. 12).

Grumel argued that Andreas did not merely extend the Anatolian cycle through another 200 years, but also reformed it with a new base-date. Like most scholars, he believed that Anatolius recognized 22 March as the date of the vernal equinox. The recognized date for Alexandrian calculations of the fourth century and later however, was, 21 March. Grumel believed that the Alexandrians reformed the Anatolian cycle in the early fourth century to take this change into account. He argued that Andreas of Byzantium undertook a similar reform, but with a different approach.

Anatolius had begun his cycle, in Grumel's view, with the new moon of the vernal equinox on 22 March. Andreas looked in the cycle for a year that would produce a new moon on 21 March. He found such a year in the twelfth year of the cycle, where Anatolius listed a 14th day of the moon on 3 April. In the already reformed cycle of Alexandria, that year produced a date for the Paschal full moon on 2 April, and Andreas decided to accept that date. Andreas could not designate that year as the first year of a cycle, corresponding to the first year of the world. Creation took place at approximately the time of the vernal equinox. The moon of creation needs to have been within a few days of full at the time of its creation, in order to illuminate the night, as the account of Genesis (1. 16) seems to require. So Andreas designated the year with a full moon on 2 April as the year 2 of the world. In the previous year the Paschal full moon was on 13 April, and the full moon of March would therefore have been 14 March. Andreas dated the creation to Sunday, 18 March, of the year that corresponded cyclically to 5509 BC and AD 344. The moon was created at the equinox on 21 March in its 21st day.

From this date for creation, according to Grumel, Andreas generated a 19-year cycle that began with a Paschal full moon on 13 April. That was a cycle 'according to convention', based on a cycle 'according to nature' that began in the following year with a 14th day of the moon on 2 April. What Andreas actually composed was eleven 19-year cycles, a total of 209 years, beginning in AD 343/4 and ending in 551/2. Since he intended his list as a continuation of that of Anatolius, he published only 200 years, beginning in 353. Grumel found a relic of the 19-year cycle of Andreas in one of the 'Paschal wheels' in the *Chronicon Paschale* (following p. 534). That text is a circle divided into 19 arcs with the 14th day of the moon on 13 April in the first year, 26 March in the last year (see Ch. 13).

Grumel's hypothesis of a reform of the Anatolian cycle in Constantinople in the middle of the fourth century has no foundation in the evidence. As I shall argue in Ch. 8, 21 March was already the conventional date for the equinox in the time of Anatolius. There was therefore no need for a reform of the Anatolian cycle, either in Alexandria or in Constantinople, in order to accommodate a change in the date. Anatolius chose 26 Phamenoth as the seat of the epact not because that was the date of the equinox, but because of an established convention in the Alexandrian calendar defining the lunar epact for the year as of the last day of the previous year.

Grumel can offer no evidence of a lunar circle actually beginning in the fourth year of a Dionysian cycle, with the 14th day of the Paschal moon dated to 2 April, prior to the emergence of the Byzantine cycle in the seventh century. The only evidence he can adduce is a cycle beginning in the third year of a Dionysian cycle, with the Paschal full moon on 13 April. As I shall argue in Ch. 12, the cycle beginning with 13 April was an innovation proposed in the sixth century, after Dionysius Exiguus had published his work

Finally, as I shall argue in Ch. 13, Grumel's distinction between cycles according to 'nature' and 'convention' is based both on a misunderstanding of a possibly corrupt text in the *Chronicon Paschale* and on a misconstruction of the usual meaning in Greek of such a distinction.

iv. The Cycle of Anatolius

There existed by the time of Cyril and Dionysius no Jewish, Byzantine, or any other 19-year cycle with a base-date corresponding to the fourth year of the classical Alexandrian cycle. The simplest explanation for the appearance of this column is that it was already present and numbered in the table of Anatolius.

I shall argue in Ch. 8 that Anatolius inserted his *saltus* not at the end of the 19th year, as Schwartz and Grumel supposed, but at the end of the eleventh year, producing in the twelfth year a Paschal 14th day of the moon on 2 April, corresponding to the first year of the circle of the moon in the tables of Dionysius Exiguus. That year was therefore quite literally the first year of the cycle of the moon. The epacts begin their 11-day intervals in that year and return to their start with a leap of 12 at the end. Continuators, redactors, and reformers maintained this column in the tables, even as they changed the position of the 12-day jump. Bede's intuition that the circle of the moon had reference to the Roman calendar may well be correct—not for the erroneous reason he suggests in ch. 56, but because of the formula he generates in ch. 57.

The 19-year cycle of Anatolius began with a lunar epact of 1 defined as of a date that corresponded both to the first day of Nisan in the Hebrew calendar and to the day before the Alexandrian civil new year on the previous 1 Thoth. The inclusion of an alternative cycle numbered from 1 in the twelfth year of the cycle provides a convenient method for calculating the epact as of 1 January, the usual convention in the Roman calendar. One has only to multiply by 11 the numbered year of the circle of the moon.

The first year of the Anatolian cycle, for example, has a new moon with epact = 1 on the last epagomenal day of the previous year. Four lunar months = 118 days later, the moon will have epact 1 on 28 Choiak, which corresponds in ordinary years to 24 December. Eight days later, on 1 January, the epact will be 9. In the first year of an Anatolian cycle, the alternative circle of the moon would be numbered as 9. The epact of the moon as of 1 January would be $9 \times 11 = 99$. Subtract the nearest multiple of 30 to yield an epact of 9. In the twelfth year, the Alexandrian epact is 3, and it is the 1st year of the circle of the moon. The Roman epact is $1 \times 11 = 11$. The reason that Bede calculated an epact of 12, instead of 11, is that his formula does not compensate for the difference between the average lunation of 29½ days and the division by 30.

Dionysius Exiguus either did not know or did not explain the reason for this apparently superfluous column. Like Bede, we can only speculate.

6. THE 14TH MOON

The 14th day of the Paschal moon, which is the 14th day of Nisan in the Hebrew calendar, is the date of the Passover 'according to the Law', as Christian writers often put it.[11] Under Christian rules, the 14th day of the moon must occur on or after the vernal equinox, and Easter will be on the first Sunday thereafter. The calendar date of the 14th moon is a function of the epact.

In the Alexandrian calendar, the relationship is easily found (Schwartz 1905: 14). The epact corresponds to the age of the moon on 26 Phamenoth, and Phamenoth has 30 days, the same number as the maximum epact. Therefore the date of the 14th Paschal moon expressed as a date in Phamenoth will be $26 + 14 - e$, or $P = 40 - e$. If P is greater than 25, the date is in Phamenoth, otherwise in Pharmouthi.

[11] Gregory of Nazianzus, *In sanctum pascha* 23, PG 36. 656; *Chronicon Paschale* 24. 2.

Dionysius gives no rule in the *argumenta* for finding the date of the 14th moon in the Roman calendar as a function of the epact. Bede (*DTR* 60) could not find a simple formula and therefore recommended memorizing both the epact and the date of the 14th moon for every year of the cycle.

A simple formula can be generated. The epact corresponds to the age of the moon on 22 March. Therefore, the fourteenth day of the moon expressed as a date in March will be $22+14-e$, or $P=36-e$. In the 17th year, for example, the epact is 26 and the date of the 14th moon is 9 April. The date can be expressed as $36-26=10$. Since the Paschal full moon cannot fall before 21 March, one adds 30. The 40th of March is the equivalent of 9 April. In the 10th year, the epact is 9, so $P=36-9=27$ March.

In constructing his 95-year list, Dionysius had no need of a formula. The dates of the Paschal full moon repeat in a 19-year cycle, and those dates were already given in his Cyrillan exemplar.

7. EASTER SUNDAY

Easter will be observed on the first Sunday after the 14th day of the moon. To find the date, it is necessary first to calculate the weekday of the 14th moon. Dionysius gives no formula specifically for this parameter, nor does Bede in commenting on the seventh column. Dionysius does present, in the 10th argument, a general rule for calculating the weekday of any date in the year by reference to the concurrent for 1 January. I discuss that rule, as well as its Alexandrian counterpart, in Ch. 6.

8. THE EASTER MOON

The last column gives the age of the moon on Easter Sunday. Under the Alexandrian rules, Easter must be the first Sunday after the 14th day of the moon. Therefore Easter Sunday can be no earlier than the 15th day of the moon, nor later than the 21st day. In the *argumenta*, Dionysius gives a formula for calculating the age of the moon as of Easter Sunday based on a count of the days since September.

6

The Computistical Rules

In the letter to Petronius, Dionysius says that he has included at the end of the tables a set of rules—*argumenta*—derived from Alexandrian science (*Aegyptiorum sagacitate*). These notes contain arithmetical formulae to convert years from Christ to the 15-year indictional cycle and vice versa, to calculate the epacts of the moon, the concurrent, the year of the *cyclus decemnovennalis*, the year in the circle of the moon, the 14th day of the moon in the month of March, the year of the bissextile cycle, and similar matters.

1. THE *ARGUMENTA*

The manuscripts include sixteen such rules (Krusch 1938: 75–81). Only the first nine or ten derive genuinely from Dionysius. One of the manuscripts (Vat. Lat. 5755) of Dionysius' *argumenta* carries the note after the 10th, 'here end the arguments for the paschal titles' (Jones 1943: 70 n. 9). In rules 11 and 12, the year 675 appears as an example, the work clearly of a later scribe. Rules 13 and 14 give complicated formulae for determining the age of the moon as of 1 January and for calculating the weekday of the 14th moon. These formulae do not fit the pattern of the simple rules in the earlier *argumenta.* Rule 15 gives the day of the month and week for Christ's conception, birth, baptism, and crucifixion. Some of the numerals in that note are corrupt, the dates given are not internally consistent, nor do they agree with the data of Dionysius' tables. The 16th argument is a discussion of bissextile days and leap years that has no direct relevance to the tables. The earliest adaptation of these rules appears in the *Computus Paschalis* attributed to Cassiodorus. With the exception of rule 7, which it omits, this text exhibits only the first ten rules, adapted now to the year 562.[1]

No earlier examples of such rules have survived. By characterizing them as derived from 'Egyptian science' Dionysius attributes to them an Alexandrian origin. Their likely source is the *quaestiones* that Theophilus of Alexandria, in

[1] Text *PL* 69. 1249–50, Pallarès 1994; discussion, Neugebauer 1981.

his letter to Theodosius, says that he appended to his 100-year Paschal table (Krusch 1880: 221).

C. W. Jones (1943: 30) believed that the extant prologue of Theophilus, entitled 'On the observance of the Pascha', constitutes these *quaestiones*. That text (Krusch 1880: 221–6) does characterize itself as a brief exposition of some 'questions' about the Pascha. It is devoted to arguing that the Paschal full moon must never be set earlier than 21 March, the day of the spring equinox, and that if the Paschal full moon should fall on a Sunday, it is necessary to defer the observance to the following week.

At the end of this text, Theophilus says 'I have produced below the hundred-year list, beginning from your first consulship.' In the letter to Theodosius, he says that he composed a hundred-year list and to it has subtended (*subieci*) the 'questions'. The 'questions' are likely therefore to have been separate from the extant prologue 'On the observance of the Pascha' and to have been a set of rules similar to those of Dionysius. Such rules appear also in Coptic and Ethiopic texts, as well as in the Paschal computus of Maximus the Confessor.[2] The 'questions' of Theophilus are likely to have been the model for these rules, as well as those of Dionysius.

i. Argument 1: The Years of Christ

If you want to know what is the year from the Incarnation of our Lord Jesus Christ, multiply 15 times 34 to get 510. To this add 12 regulars, total 522. Add the Indiction of the year you want, for example the 3rd in the consulship of Probus the Younger, the total is 525. These are the years from the Incarnation of the Lord.

This first rule generates the number of the year since the Incarnation from the indictional number. The computist needs to know already approximately how many years there have been since the Incarnation and then find the closest exact multiple of 15 that will not exceed the approximation, in this case 34. The 'regulars' refer to a constant to be added in any formula. Here, the '12 regulars' derive from the fact that a year of the Lord that is an exact multiple of 15 always corresponds to a third indictional year. So the addition of 12 takes one to the last year of the current Indiction cycle, from which point the addition of the indictional year gives the desired result, AD 525.

The year 525 appears as an example also in rules 2, 4, 5, 6, and 8. Readers ancient and modern have rightly concluded that Dionysius published his work during the consulship of Probus, 525 years from the incarnation. Hence this consular date appears in some manuscripts in the heading of the

[2] Neugebauer 1979*a*: 70–6; Maximus *PG* 19. 1234–70.

tables (Krusch 1938: 68), equated with the third year of the Indiction, the thirteenth year of the 19-year cycle, and the 10th year of the circle of the moon, but not with a numbered year from the Incarnation.

ii. Argument 2: The Indiction

If you want to know what the Indiction is, for example in the consulship of Probus, take the 525 years from the Incarnation of our Lord Jesus Christ. To these years you always add 3, which is 528. Divide by 15 and there is a remainder of 3. So it is the third indictional year. If there is no remainder, it is the 15th indictional year.

This rule is the converse of the first. Divide the years of the Lord by 15. Since every whole multiple of 15 is a third indictional year, add the constant 3. Then divide by 15 and find the remainder.

iii. Argument 3: The Epacts

If you want to know how many are the epacts, that is, the lunar additions, then take the years since the Incarnation of our Lord Jesus Christ, which have been 525. Divide these by 19, the remainder is 12. Multiply by 11, there are 132. Divide those by 30, the remainder is 12. There are twelve lunar additions.

This and the following are the most important of the rules. Even without access to a table, it is possible to calculate both the epact and the concurrent directly from the number of the year since the Incarnation, if one knows these two simple rules.

The epact increases by eleven in each year of the cycle. Therefore the epact can be calculated if one knows the epact for the first year of the cycle and the position within the cycle of any given year. The cycle of Dionysius begins with epact 0. Accordingly, the year of the cycle minus 1 multiplied by 11 will give the total number of lunar days elapsed from the beginning of the cycle. That number divided by 30 yields the epact as a remainder.

The cycle of Dionysius begins with the year of the Lord 532. The number 532 is divisible by 19 with a remainder of 0. Therefore the remainder from that division is the same as the year of the cycle minus 1. Dionysius no doubt simply adapted this rule from a similar rule in his source that used the years of Diocletian. The Alexandrian cycle has a base-date of Diocletian 1. Therefore the original rule will have been to subtract 1 from the year of Diocletian and then proceed as Dionysius sets forth.

iv. Argument 4: The Concurrent

If you want to know the solar additions—that is, the concurrent days of the week—take the number of the years from the Incarnation of the Lord—for example, 525 for the third Indiction. Of the years that have passed always add the fourth part, which is now 131, for a total of 656. To these add 4, and there are 660. Divide those by 7; the remainder is 2. Two are the epacts of the sun, that is, the concurrent days of the week, for the aforementioned Indiction, in the consulship of Probus Junior.

A formula of this kind for finding the days of the week works whether the years are numbered from the Incarnation, from Diocletian, from the creation of the world, or from any other starting point. Since 365 days exceeds 52 weeks by one day, the day of the week for any given date advances by 1 for each year and by 1 more for each leap year. Therefore the number of the years elapsed tells us by how many days the solar epact has advanced since the starting-point for each year, and one-quarter of that number tells us by how many more days the epact has advanced for each leap year in the same interval. The formula works best when the year 1 is also the beginning of the four-year leap-year cycle. Such is the case both for years from Diocletian and years from the Incarnation.

Dionysius says that one must add 4 to the result. This constant is required because the table of Dionysius begins in the year 532 with a concurrent of 4. Dionysius knew that was the correct number, because the 95-year table he was continuing ended with concurrent 2 in the year 247 of Diocletian, and the year 248 was a leap year.

v. Argument 5: The 19-year Cycle

If you want to know what year it is of the cycle of 19 years, take the years of the Lord, for example 525, and always add one, for a total of 526. Divide these by 19, 13 remain. The year is the thirteenth in the 19-year cycle. If there is no remainder, it is the 19th year.

This formula yields what came to be known in the Middle Ages as the 'Golden Number'. The term first appears in the poem *Massa compoti* by Alexander de Villa Dei at the turn of the thirteenth century (Wijk 1936). The famous liturgist and canon lawyer Guillaume Durand, who became bishop of the French city of Mende in 1285, explained that just as gold excels all other minerals, so the Golden Number surpasses all other lunar data.[3] In

[3] Durand, book 8, ch. 11.

some medieval Easter tables the numbers of the 19-year cycle appear in gold, but that convention may well postdate the name.

Since the cycle of Dionysius begins with 532 and 532 is divisible by 19 with a remainder of 0, one must add 1 to the years of the Lord before working the formula. In effect, the cycle of Dionysius has a base-date of 0. That is, a 19-year cycle would begin in the year before AD 1. In Dionysius' Alexandrian source, with its base-date at Diocletian year 1, the addition of 1 to the number of the year was not necessary.

vi. Argument 6: The Lunar Cycle

If you want to know which cycle it is within the nineteen-year circle of the moon, take the years of the Lord, for example 525. Always subtract 2, there remain 523. Divide these by 19, there remain 10. It is the tenth cycle of the nineteen-year circle of the moon. If there is no remainder, it is the nineteenth.

This formula is a variant of Argument 5. It finds now the position of the year within the circle of the moon contained in column 5 of the tables. As in Argument 5, it is necessary first to add 1 to the years of the Lord. Since the circle of the moon begins in the fourth year of the cycle, the computist then must subtract 3. The net subtraction is 2.

vii. Argument 7 (Spurious)

The seventh argument states that in years 2, 5, 7, 10, 13, 16, and 18 the fourteenth day of the moon falls in March, in April in the other twelve years. The text refers to a formula 'contained below' for calculating the 14th day of the moon. No such formula appears in the genuine rules of Dionysius. For this reason and because the seventh argument does not appear in the Cassiodoran computus of AD 562, it is probably not authentically from the pen of Dionysius Exiguus (so Declercq 2002: 199 n. 2).

viii. Argument 8: The Bissextile

If you want to know when the bissextile day is, take the years of the Lord, for example 525. Divide these by 4. If there is no remainder, it is bissextile. If the remainder is 1 or 2 or 3, it is not bissextile. In order to avoid any cloud of error, note that whenever you make a calculation by division, if there is no remainder, it is the same number by which you divide. For example, in division by 19, if there is no remainder, the number is nineteen; if by 15, it is fifteen; and by 7, seven.

This is the rule about leap years in the Julian calendar. If the number of the year AD is divisible by four, it is a leap year. The same rule applied in Dionysius' Alexandrian exemplar. If the year of Diocletian is divisible by four, it is a leap year. In the Alexandrian calendar, however, the extra day was actually inserted as an additional day before the beginning of the numbered year in question. Some scholars have supposed that Dionysius chose precisely the year 532 for the beginning of his table—rather than 534 or 535—in order to maintain this divisibility by 4 in leap years (see Ch. 15).

In the modern Gregorian calendar, there is an exception to the rule. A year divisible by 4 with no remainder is a leap year, except in century-years, unless the century year is also divisible by 400.

ix. Argument 9: The Easter Moon

If you want to know which moon it is on Easter day, if Easter is celebrated in the month of March, count the months from September to February, which are 6. To these always add the constant 2, there are 8; add the epacts, that is, the lunar additions of the year you want, for example 12 for the third Indiction, total 20. Add the day of the month on which Easter is celebrated, that is 30 March, for a total of 50. Subtract 30, the remainder is 20. It is the twentieth moon on the day of the Resurrection of the Lord. If we celebrate Easter in the month of April, count the months from September to March, which are 7. To these always add 2, there are 9. Add the lunar epacts of the year you want, for example 23 for Indiction 4, which are 32. Add the day of the month in which we celebrate Easter, that is 19 April, for a total of 51. Subtract 30, the remainder is 21. The moon is 21 on the day of the Resurrection of the Lord.

This is the most interesting of the *argumenta*, for it clearly reveals the Alexandrian origin of these rules. It also confirms the hypothesis advanced in Ch. 5 that in the Alexandrian calendar the lunar epact was considered for computistical purposes as equivalent to the last epagomenal day before the beginning of the year in question, corresponding to 28 August in the Roman calendar in common years, 29 August in a leap year.

Instead of telling his readers to compute the epact for Easter Sunday by counting the days elapsed since the 14th day of the moon, Dionysius instructs them to make the count from the preceding September. In the case of an Easter Sunday in March, take the number of whole months elapsed, which is 6, add the day of the month, the epact of the year and the constant 2. For April, take 7 months plus the epact and the day of the month and again the constant 2. Take away 30, and the remainder is the epact of the moon for Easter Sunday.

This rule becomes more intelligible if we reconstruct the Alexandrian formula from which Dionysius was working. There are two methods an Alexandrian computist might use to determine the age of the moon on Easter Sunday.

One approach relies on the relationship between the epact (e) and the date (P) of the 14th day of the Passover moon. As I explained in Ch. 5, commenting on column 6 of the table, this relationship can be expressed as the remainder when divided by 30 of $P = 40 - e$. The lunar age (L) as of the date of Easter Sunday (S) will be $L = 14 + S - P$. Therefore, if $P = 40 - e$, then $L = 14 + S - (40 - e) = S + e - 26$. In modular arithmetic with division by 30, -26 is the equivalent of $+4$. Accordingly, $L = S + e + 4$.

To convert this result to the Roman calendar one must add the number of days that the Roman calendar, with its months varying between 28 and 31 days, exceeds the Alexandrian calendar with its equal months of 30 days. That number is 4 in March and 5 in April. For example, we know that 26 Phamenoth = 22 March, a differential of 4. Because there are 31 days in March, it follows that in April the differential will be 5. We therefore have for dates in March the formula $L = S + e + 8$ and for April $L = S + e + 9$. Dionysius has broken these additions into $(2+6)$ and $(2+7)$.

This was the approach that Otto Neugebauer (1981: 297–8) took when commenting on this rule as it appears in the Cassiodoran computus. Neugebauer derives the formula $L = S + e + 4$ for the Alexandrian calendar, then adds the 4 additional days for March, and 5 for April. He notes that the counting of the months from September is a 'reminiscence' of the Alexandrian calendar. He states, however, that the separation of 8 into $6+2$ and 9 into $7+2$ 'is meaningless and has nothing to do with the months'.

A different approach will make better sense of the formula as a special case of a more general rule for determining the age of the moon as of any date in the Alexandrian calendar. The epact (e) is defined as of the last epagomenal day. Every month in the Alexandrian calendar has 30 days, and epacts are counted from 1 to $30 = 0$. The average lunation is, however, only 29½ days. Therefore, the lunar epact advances by 1 for every two months. That is, if 1 Thoth was day 1 of the moon, then 1 Athyr two months later will be day 2 of the moon.

In the Alexandrian calendar, therefore, one can compute the lunar epact (L) for any numbered calendar month (m) and day (d) with the formula $L=[(e + (m/2) + d)/30]_r$. Except for the first few days of the first month (Thoth), half-days should be counted as whole. For both Phamenoth, the seventh month, and Pharmouthi, the eighth month, the number to be added to $e+d$ is therefore 4. So the formula can be expressed as the remainder after division by 30 of $e+4+d$.

St Maximus (*PG* 19. 1268–9) attests to an Alexandrian formula of this kind. To calculate the age of the moon as of any day in the Alexandrian calendar, he says, take the lunar epact, add the day of the month, one-half the number of months since Thoth, and one regular. If the result is less than or equal to 30, that number is the age of the moon. If it is greater than 30, take away the multiples of 30. Maximus does not give an example, so it is not clear why he adds one regular. Perhaps he counts the months elapsed since Thoth, instead of including Thoth in the count. As I noted in Ch. 5, this formula calculates the age of the moon in relation to the annual epact, without regard to the lunar new year of the theoretical 19-year cycle.

To convert this rule to the Roman calendar, with the count beginning from 1 September, we must add the constant 3, which is the number of days between 28 August, the last epagomenal day, and 31 August, the last day before 1 September. For computing the lunar epact for a date in March, we have the constant of $+4$ in the Alexandrian formula plus the constant of $+3$ for the conversion to 1 September, for a total of $+7$. We must also account for the fact that there are 181 days in the months from September through February, instead of the 180 in the Alexandrian months from Thoth through Mechir. So the number to be added is now 8, as in Dionysius' formula. For April, we must add the additional day by which the 31 days of March exceed the 30 days of Phamenoth for a total of 9.

The separation of these numbers into $2+6$ and $2+7$ is not 'meaningless', but represents the conversion into the Roman calendar of a general rule in the Alexandrian calendar based on the counting of the months. The $+3$ required for the conversion from Thoth to September equals one-half the whole number of months elapsed from September to March. Therefore, instead of dividing the number of the month by half, Dionysius adds 3 to the Alexandrian formula by counting the whole number of months elapsed. So the formula is now $e+6+d$ for March, $e+7+d$ for April. To this must now be added $+1$ for the extra calendar day from September through February and $+1$ for the extra lunar day in the Alexandrian formula in the 7th and 8th month—thus the constant of 2.

That this division of the months by half was the original Alexandrian rule underlying the ninth argument can be inferred from the use of such a rule by Boniface in his letter to Pope John on the date of Easter for the year AD 526. As explained in Ch. 4, the issue was whether the age of the moon on 19 April in that year was 21 days as in the last cycle of the Cyrillan table or 22 days as calculated by Victorius of Aquitania. At the end of the letter, Boniface cites the Egyptian rules (*Egiptiorum argumenta*), as follows.

They take first the epacts, that is the lunar additions, which are for this fourth Indiction year 23, and add 4, which is half the number of the 8 months from

September to April, for a total of 27. To these they add the number of the day on which the Paschal feast occurs, which on the 13th day before the Kalends of May is 19 days. Because we know that 5 Egyptian days have passed, the total is 24 and the entire sum is 51. From this, subtract 30, the remainder is 21, which is the number of the Easter moon. (Krusch 1926: 57.)

Georges Declercq (2002: 202–3 n. 99) has recently cited this text as confirmation of Neugebauer's hypothesis and suggests that the formula of Boniface represents the original ninth argument of Dionysius, which either Dionysius or a later scribe subsequently modified to the form in which the manuscripts now present it. In fact, the text shows that Neugebauer's approach is incorrect. Since the rule appears in the Cassiodoran computus in the same form as in the manuscripts of Dionysius' *argumenta*, it is unlikely to be the work of a redactor, rather than Dionysius himself. Boniface was probably citing the rule as it appeared in the original *argumenta* appended to the Cyrillan table, of which he certainly had a copy even before Dionysius submitted his continuation.

In the manuscripts of Dionysius, the ninth argument continues with a formula for counting lunar epacts during the period from September through December, with a correction that must be made for leap year. This rule is not included in the Cassiodoran computus. It is probably not authentically from the pen of Dionysius, and it poses some textual and arithmetical problems that need not detain us here.

x. Argument 10: The Days of the Week

If you want to know what the day of the week is, take the days from January up to the month you want, for example the 30th day of March, there are 89. To these always add one, there are 90, and always add the epacts of the sun, [that is the concurrent days of the week], for the year you want, for example in the 3rd Indiction, add 2, the total is 92. Divide by 7, the remainder is 1. Therefore it is Sunday, the very day of the Paschal feast. [In this way, you can find whatever day you want, from the first of January to the 30th day of December, by counting and then adding the constant of 1 and the concurrents that begin in the month of January.]

The words bracketed in the translation are in the text of the Dionysian *argumenta*, but not in the Cassiodoran computus. They may be additions by a redactor.

The 10th argument itself is straightforward enough, provided one knows how many days there are in each month of the Roman calendar. Neugebauer (1981: 299) interprets the constant of 1 as the weekday differential between 1 January and 24 March in an ordinary (non-leap) year. This formulation is not quite right. In the year of Dionysius' example, AD 525—and in every other non-leap year—1 January (Wednesday in 525) is two weekdays ahead of 24 March (Monday in 525). The differential is therefore + 2. The differential is + 1 only in a leap year. Since 1 January is included in the number of days, the count actually proceeds from 31 December. With that correction, Neugebauer is right. The formula yields the wrong result in leap years for dates in January and February.

2. THE YEAR 525 AND THE DIONYSIAN PROBLEM

Throughout these rules, Dionysius uses as his example the consulship of Probus, a third indictional year, and the year 525 from the Incarnation. The much-vexed 'Dionysian problem' is how he knew that the consulship of Probus should be numbered AD 525 and that the year 247 of Diocletian at the end of his exemplar should be followed by AD 532 at the beginning of his continuation. The prevailing view is that Dionysius calculated a date for the Incarnation and Nativity, but that he either made a mistake or manipulated the numbers to make them suit some computistical scheme.

Yet Dionysius treats the equation between AD 532 and Diocletian 248 so routinely as to suggest that the synchronism was already well established. As these *argumenta* clearly show, his work is so thoroughly Alexandrian and he is at such pains to defend Alexandrian science, that it is to Alexandria that we should look for the origin of Dionysius' year 1. Part Three is devoted to the history of these Alexandrian calculations between about AD 200 and 640, with a discussion also of their Roman competitors up to the time of Dionysius Exiguus.

Part III

Paschal Calculations in Early Christianity

This page intentionally left blank

7

The 8-Year Cycle and the Invention of the Epacts

The evidence for the history of Paschal calculations before the time of Dionysius Exiguus and for the emergence in the Greek church about a hundred years later of the distinctive Byzantine cycle is surprisingly sparse. The basic information comes from the *Ecclesiastical History* of Eusebius of Caesarea, written about AD 300 and published in one or more revised editions between about 311 and 325.[1] To supplement what Eusebius reports, we have fragments of information and a few lists of dates in sources ranging from the third century AD to the fifteenth, in the Armenian, Syriac, Coptic, Arabic, and Ethiopic languages, as well as in Greek and Latin.

1. DEMETRIUS OF ALEXANDRIA, INVENTOR OF THE EPACTS

The calculation of epacts and weekdays for any day in any month of any solar year is a complex matter. The Roman calendar with its days numbered backwards from Kalends, Nones, and Ides complicates things further.[2] Nevertheless, to generate a new Paschal table from an existing exemplar is relatively straightforward, as Dionysius himself points out in the letter to Petronius. Otto Neugebauer (1979*a*: 105) suggested that the compilation of Dionysius' table 'could not have taken him more than one hour'.

It would have taken many hours for Dionysius just to transcribe a 95-year table, let alone make the decisions required to extend that table through another 95-year period. An hour is, however, ample time to generate a simple list of new or full moons for just one lunation in each successive year of the

[1] Schwartz 1909: xlvii–lxi; Barnes 1980; Burgess 1997.
[2] Jones 1943: 48 with n. 2; cf. Wallis 1999: xlviii, Declercq 2002: 178.

Alexandrian calendar. All that is necessary is to observe (or otherwise know the date of) one first-visible crescent of the moon and to recognize the 11¼-day difference between a lunar calendar of 354 days and a solar calendar of 365¼ days. Such evidence as we have suggests that it was Demetrius, bishop of Alexandria from 189 to 232, who first put a system of 'epacts' into the service of Paschal calculations.

Eusebius first mentions Paschal calculations at Alexandria in connection with the name of Dionysius, who he says was bishop of Alexandria during the reign of the emperor Gallienus (253–68). In his *Chronicle* (p. 218 Helm), Eusebius dates the episcopate of Dionysius from 249 to 265. In the *Ecclesiastical History* (*HE* 7. 20), Eusebius reports that Dionysius wrote Paschal letters in which he expounded with great solemnity on the subject of the Easter festival. In one of those letters, Eusebius says, Dionysius 'propounded a rule based on an 8-year cycle, and demonstrated that at no time other than after the spring equinox is it legitimate to celebrate Easter'.

According to Eusebius, such Paschal letters were already being exchanged among bishops by the end of the second century at the time that controversies arose about the Asian practice of observing the Pascha on the 14th day of the Passover moon, regardless of the day of the week. Eusebius says (*HE* 5. 23) that episcopal letters on the subject are extant from Theophilus of Caesarea, from the bishops of the Black Sea region, from Gaul, Osrhoene (Edessa), Corinth, and others.

The bishop of Alexandria at this time was Demetrius. Eusebius says (*HE* 5. 22, 6. 26) that he became patriarch of Alexandria in the tenth year of the emperor Commodus (180–92) and remained in office for 43 years. In the *Chronicle* (p. 209 Helm), he dates the first year of the episcopacy of Demetrius to 189/90. The last year was therefore 231/2. Eusebius has much to say about Demetrius in his relationships with the Christian philosopher Origen (*HE* 6. 2–3, 8, 16, 19, 26), but does not specifically mention him in connection with the Paschal controversies of the time.

According to the tradition of the Coptic church in Egypt, Demetrius was very much a participant in these controversies and indeed proposed a method for promoting ecumenical agreement on the date of Easter.

The earliest source is Saʿīd ibn Bitrīq, an Arabic-speaking Christian who became the orthodox patriarch of Alexandria from 933 to 940 under the Greek name of Eutychius. Among his many writings was a history of the world from Adam to his own times, in Arabic, under the title 'Chaplet of Pearls'. Of Demetrius, Eutychius says (*PG* 111. 989) that he sent letters to 'Gabius' of Jerusalem, Maximus of Antioch, and Victor of Rome about a method of computing the time of the Paschal observance and of the fasting. Previously, according to Eutychius, Christians observed the forty days' fast immediately after the feast of the baptism of Jesus (6 January). Demetrius and his fellow patriarchs ordained that the forty days of fasting should instead precede the Paschal fast. A few pages later (*PG* 111. 1007), Eutychius says that the Council of Nicaea approved the Paschal calculation established by Demetrius of Alexandria, 'Gaianus' of Jerusalem, and Victor of Rome.

The Coptic calendar of Holy Days (Synaxarium), composed in Arabic in the twelfth or thirteenth century from various more ancient sources (Burmester 1938), supplements this information. On the 12th day of the month of Babah (9 October), the Copts commemorate the death in the Christian year 224 of Demetrius, 12th Pope of Alexandria. The Christian era used here is that of Annianus of Alexandria, corresponding to AD 9 (see Ch. 16). The year 224 therefore corresponds to AD 232 and agrees with the dates given by Eusebius for the episcopate of Demetrius, AD 189/90–231/2. This entry in the Synaxarium (pp. 47–8) includes the information that Demetrius invented the epacts, that he established the Lenten fast of forty days, and that he sent letters to the bishops of Jerusalem, Antioch, and Rome. Prior to that time, according to the entry, Christians had observed the forty days' fast immediately after Epiphany.

Another notice (p. 93), with similar information, appears at the 10th day of the month of Hatur (6 November), commemorating a Council at Rome at which Victor received a letter from Demetrius and accepted his regulations for calculating the days of the fast. It reads as follows:

> The reason for this council was that Christians used to celebrate the Feast of the Baptism, followed on the morrow, on the 12th of the month of Tubit (7 January), by the fast. Then they broke the fast on the 22nd of Mechir (16 February). They observed the feasts of the Passion and the Resurrection some days thereafter. But when Pope Demetrius was consecrated . . . he established the calculation by epacts for regulating the dates of the fast and the Resurrection. He sent letters to Victor of Rome, Maximus of Antioch, and Agapius of Jerusalem.

The entry goes on to report that when Victor received the letter he summoned a council of 14 bishops and a number of savants. At that meeting they accepted the formula of Demetrius and established the standard regulations for fasting and for Easter.

Another version of the tradition appears (p. 244) for the fourth day of Baramhat (31 March), commemorating a council on the island of Bani-Omar. The bishop of that place had sent letters to Serapion of Antioch, Democratus [*sic*!] of Rome, Demetrius of Alexandria, and Symmachus of Jerusalem on the issue of Quartodecimanism. All replied that Easter was to be observed only on the Sunday following the Passover. The local bishop called a council of some eighteen bishops at Bani-Omar at which these letters were read. Some of the dissidents agreed to observe Sunday, others persisted in their ways and were excommunicated. Demetrius decided to try to mediate the dispute. He called a meeting of astronomers, including Ptolemy of Pharos, and with their help established the reckoning by epacts to determine the day of the Jewish Passover and to fix the Feast of the Resurrection on the Sunday thereafter.

The Ethiopic tradition, which derives from the Coptic church of Alexandria, also celebrates Demetrius as the founder of the Paschal calculus. Job Ludolf (1691: 438–9, 448) published three stanzas of Ethiopic poetry praising Demetrius as 'the inventor of the epacts':

> Hail to Demetrius, who regulates abstinence from drink,
> who organizes the fasting from food for the Fifty Days,
> had he not been inspired by the Holy Spirit of Revelation,
> how could he ever have found and discovered
> the calculation for periods of time that is called 'epact'?
>
> Hail to you, O priests, to you be given thanks and praise
> that you came diligently and without delay
> to that place of gathering and assembly
> where the calculation by epact taught by the Holy Spirit
> was communicated to you through the revered Demetrius.
>
> Hail to your hands, O Demetrius, which wrote
> the calculation of the epacts, both past and future...

Several manuscripts of the Ethiopic computistical tradition recently studied by Otto Neugebauer (1979*a*: 92–3) attribute to Demetrius a 'Computus' written in the 26th year of his episcopate and the 206th year since Christ. The Christian era is again that of Annianus, and the 206th year corresponds to AD 214. The 26th year of the episcopate of Demetrius, in the chronology that Eusebius gives, would also correspond to 214.

There are some problems, chronological and historical, with this tradition. Eutychius says that Demetrius sent letters to Maximus of Antioch and 'Gabius' or 'Agapius' of Jerusalem. According to Eusebius, Demetrius became patriarch the year before Maximus of Antioch died in 190/191, while Victor became bishop of Rome in 193/4 and served for ten years.[3] If the date in AD 214 for the 'Computus' of Demetrius has any historical basis, then neither Maximus nor Victor was still in office at the time that Demetrius 'invented the epacts'. The name of 'Gabius' or 'Agapius' as bishop of Jerusalem is not consistent with what Eusebius reports about that church. Eusebius says (*HE* 4. 5) that he was unable to find any evidence for dates of the bishops of Jerusalem, although he had lists

[3] Eusebius, *Chronicle*, pp. 207, 209 Helm. Here and at *HE* 4. 24, the manuscripts have the name 'Maximinus'. Syncellus 667.11 writes 'Maximus'.

of names and says their episcopates are known to have been very short. Eusebius includes two persons by the name of 'Gaius' or 'Gaianus' as bishops of Jerusalem, numbered as 22 and 24 in a list of Gentile bishops beginning with one Mark in the time of the emperor Hadrian (*HE* 5. 12, *Chronicle*, p. 204 Helm). Neither name appears in the list that he gives for the period of the 190s and following (*Chronicle*, p. 209 Helm). He names Narcissus as bishop of Jerusalem, co-chairman with Theophilus of the conference of bishops who met at Caesarea to discuss the Easter controversies (*HE* 5. 25). In his list for the 190s, Narcissus was succeeded by Dios, Germanios, Gordios, and another Narcissus. Eusebius says that Alexander became bishop in AD 212/13, serving as coadjutor with Narcissus (*Chronicle*, pp. 209, 213 Helm; cf. *HE* 6. 8. 4).

The notice for the fourth day of Baramhat names different persons as occupants of the various sees in the time of Demetrius—Serapion at Antioch, Democratus at Rome, and Symmachus at Jerusalem. According to Eusebius (*Chronicle*, pp. 209, 213 Helm), Serapion was indeed a contemporary of Demetrius, serving at Antioch from 191 to 210. The name of Symmachus appears in Eusebius' list for Jerusalem at a much earlier period (*Chronicle*, p. 204 Helm; cf. *HE* 5.12). No 'Democratus' of Rome is otherwise known. Nor can Demetrius have summoned to a meeting the astronomer Claudius Ptolemy, who died some ten years or more before Demetrius became bishop.

In addition to this problem with the names of the bishops, there is the historical question of whether it is true that Demetrius established the Lenten fast of forty days. According to the Coptic tradition, the Alexandrian church had previously observed the 40-day fast after the festival of the baptism of Jesus in January, thus more directly commemorating the forty days that the Gospels (Mark 1: 13, Matt. 4: 1, Luke 4: 2) say Jesus spent fasting in the wilderness after his baptism by John. Demetrius established what became the standard fifty days of Lent by transferring the forty-day fast to the period before Easter and adding it to the fast of Holy Week.

Against this tradition, there is evidence to suggest that it was Athanasius, not Demetrius, who established the Lenten fast. Apart from the Coptic tradition on Demetrius, there is no certain reference to a 40-day Lenten fast before the time of Athanasius. In his letter to Basilides, Dionysius of Alexandria discusses only the fast of Holy Week and mentions a diversity of practices.[4]

Some of the Paschal letters of Athanasius, bishop of Alexandria from 328 to 373, have survived in a Syriac translation (see Ch. 9). At the end of each letter, Athanasius gives the dates for the beginning of the fast and for Easter Sunday. Nowhere in the body of the letter is there any indication of the year. That and

[4] *PG* 10. 1277; pp. 54–58 Bienert.

other information is, however, provided in a heading, which seems to be the work of one or more editors (see Ch. 9).

In several of these letters, numbered as 1, 4, 5, and 14, corresponding to the years 329, 332, 333, and 342, Athanasius prescribes a fast only for Holy Week, from Monday to Saturday. In the letters numbered 2, 3, 6, 7, 10, 11, 13, and 19, for the years 330, 331, 334, 335, 338, 339, 341, and 347, Athanasius calls for a fast of forty days, beginning on a Monday, several weeks before Easter. For the year 340, when Athanasius was in exile in Rome, the usual Paschal letter is not extant. The collection does preserve a letter to Serapion, one of the bishops of Egypt, urging him to proclaim the fast of forty days and to encourage the brethren to observe it, so that the Egyptians will not be alone among the Christians of the world in failing to fast during this period. The letter is numbered as 12 and therefore assigned to the year 340. René-Georges Coquin (1967) has therefore argued that it was Athanasius who transferred the 40-day fast from Epiphany to Lent.

Some of the surviving letters seem to have been numbered and dated incorrectly. It makes sense that the letters providing only for a one-week fast should be grouped together at the beginning of Athanasius' patriarchate, while those that add a 40-day Lenten fast should all be later. Several sets of years—330, 341 and 352; 331, 342, and 353; 333 and 339; 334 and 345; 335 and 346; 338 and 349—all share the same date for Easter Sunday in the Alexandrian cycle. It is likely therefore that letter 2 belongs to 341 or 352, instead of 330, and letter 3 to 342 or 353, instead of 331. Letters 6 and 7 might belong to 345 and 346, instead of 334 and 335, and letter 10 to 349, instead of 338. The letter to Serapion probably belongs to 340 or 341. If the Lenten fast was a recent innovation at that time, then the letter for 339 would represent the earliest certain evidence for that custom in Egypt. Alberto Camplani has recently argued that letters 6, 7, and 10 are correctly dated to 334, 335, and 338 and that it was therefore in 334 that Athanasius introduced the Lenten fast.[5]

In any case, the core of the Coptic tradition—that Demetrius was the 'inventor of the epacts' and that he had a particular concern for the regulation of the fast—is likely to be true. According to Eusebius (*HE* 5. 23), regulation of the fast was one of the issues under discussion in the time of Demetrius. The invention of the epacts is the necessary first step towards the construction of a Paschal table. Someone in the early third century must have taken that step, and there is no reason to deny that is was Demetrius.

The earliest Paschal calculus was probably a list of dates for the 14th day of the Passover moon such as that we find attributed to the Jews in the document

[5] Camplani 1993; cf. Camplani 1989: 171–83, 2003: 178–9; for a good brief summary of the entire problem see Barnes 1993: 183–91.

from the Council of Sardica (see Ch. 9). Such a list is constructed by starting with one known date for the Passover full moon and then subtracting eleven days in each successive year. When that subtraction results in a date for the full moon so early that it can no longer be considered as a vernal moon, when 'the barley is ripe' (Exod. 13: 4), one adds 30 days, so that the 14th day of Nisan advances by 19 days in relation to the previous year.

While such a scheme is based on the 11-day annual differential between the sun and the moon, it is not a system of epacts. The method produces a repeating cycle after 30 years, but 30 Julian years is not a good fit between solar days (10,957.50) and whole lunar months averaging 29½ days (10,957.50/29.5 = 371.44).

Lunar 'epacts', as the name implies, are additions to the moon. In a system of epacts, the calculator adds 11 days to the age of the moon each year as of some date in a solar calendar. Usually that date is either the first day of the civil calendar or, to simplify calculations, the day before. The epact for the year, the number of additions to the moon, becomes the basis for determining the age of the moon as of any date in the solar calendar.

When Demetrius 'invented the epacts', he discovered a device for calculating the date of 14 Nisan that would produce a periodic list after eight years. Working with the Alexandrian calendar and its equal months of 30 days each, Demetrius decided to number the days of the moon from 1 to 30 and to express the age of the moon as of some date that would be convenient for calculating the date of the 14th day of Nisan. We do not know what date he chose, but it may very well have been he who adopted what was later the standard practice of defining the epact as of the last epagomenal day in the Alexandrian calendar.

The next step is to decide what date should be set as the limit before which the Paschal full moon cannot fall. In the classical Alexandrian system, that date was 21 March, the vernal equinox. In the earliest period, the 14th day of the moon was allowed to precede the equinox, so long as Easter Sunday itself followed the equinox. The rule that Eusebius (*HE* 7.2 0) attributes to Dionysius of Alexandria states, 'not otherwise than after the spring equinox is it proper to observe the Paschal feast'. If in the time of Demetrius and Dionysius the equinox was already defined as of 25 Phamenoth = 21 March, then the earliest date for Easter is 26 Phamenoth = 22 March. The earliest possible date for 14 Nisan would therefore be 19 Phamenoth = 15 March, but the actual date in any given year would depend on the days of the week.

If Demetrius wanted to construct a list in which the dates of 14 Nisan would begin to repeat after some period, he would need to modify the year-to-year advance of the epacts such that the accumulation equalled a multiple of 30 at some point. The shortest period within which that would be the case is eight years—the octaëteris. After eight years, the epacts total 88 days; and during the same period there are two additional days for leap year. Thus, one need only add an additional lunar day in each of two leap years to make the epact move by 12, instead of 11, with a total of 90, instead of 88.

Eusebius first associates the use of the octaëteris with Dionysius of Alexandria. Sozomen (7.18) attributes the use of an 8-year cycle to the Montanists of Asia Minor. The origins of the Montanist community are approximately contemporary with the episcopate of Demetrius. Eusebius dates Montanus to the reign of Marcus Aurelius (161–80), Epiphanius to the 19th year of Antoninus Pius (157).[6] T. D. Barnes (1970) has argued in favour of the Eusebian chronology. How early the Montanists might have adopted an 8-year cycle and from what source is debatable (Strobel 1977: 178–85).

According to the Ethiopic texts, Demetrius established his method of calculation beginning from the year corresponding to AD 214. The earliest extant Paschal table of any kind—that attributed to Hippolytus—is based on the 8-year cycle and begins in AD 222, exactly eight years later. The Paschal table of Hippolytus is a document of the Roman church. It is, however, written in Greek. As Marcel Richard has suggested (1974: 309), the Hippolytan table probably represents the adoption in Rome of Demetrius' methods, adapted to the Roman calendar and to the Roman rules. Under those rules, according to Victorius of Aquitania (Krusch 1937: 19), Easter must not be observed before the 16th day of the moon nor after the 22nd. The Romans also prohibited any observance of Easter Sunday after 21 April, as we know from a letter of Pope Leo I on the subject.[7] As we shall see, the Hippolytan table adheres to those rules.

2. THE PASCHAL TABLE OF HIPPOLYTUS

Writing of the times of the emperor Alexander Severus (222–35), Eusebius (*HE* 6. 22) says that Hippolytus, author of many other works, composed also, in the first year of the emperor Alexander Severus, a treatise 'On the Pascha', in which he set forth a table of dates and wrote a list for a 16-year cycle for the Pascha. Eusebius lists a few of his other writings, including 'On the Six Days', 'After the Six Days', 'Against Marcion', 'On the Song', 'On Parts of Ezekiel', and 'Against All Heresies'. Until the sixteenth century, this brief comment of

[6] Eusebius, *HE* 5.3; Epiphanius, *Panarion* 48.1, 2: 319 Holl.
[7] Leo to Marcian, Letter 121, *PL* 54. 1057; Krusch 1884: 259.

Eusebius and later authors dependent upon him was all that we knew about the Paschal table of Hippolytus.

i. The Inscribed Statue

About1550, the headless statue of a seated figure was discovered near the Church of San Lorenzo fuori le Mura, in the suburbs of Rome.[8] Inscribed in Greek characters on a plinth on the rear of the chair is a list of writings. These include a work 'On the Psalms', 'On John the Evangelist and the Apocalypse', a 'Chronicle to the Greeks', an 'Apostolic Tradition', and a 'Demonstration of the dates of Easter in Tabular Form'. On the right side of the chair there is a heading above a 16-year table of Paschal full moons. On the left side of the chair there is a 112-year list of dates for Easter Sunday, under the heading, 'First year of Alexander Caesar: the Sundays of the Pascha year by year: points indicate the bissextum.' The inscriptions belong paleographically to the first half of the third century (Brent 1995: 3–4). At the head of the 16-year table the inscription reads:

> In the first year of the Roman emperor Alexander Severus, the 14th of the Paschal moon fell on Saturday, the Ides of April, during an embolismic month. For the succeeding years it will be as indicated in the table below. Events of the past were as noted. One must break the fast when Sunday comes.

Alexander Severus became emperor in March of 222.[9] Modern astronomical calculations agree that the moon was full on 13 April of that year. No name appears on the statue. The inscription led its discoverers to believe that the 16-year table is the same that Eusebius attributed to Hippolytus and that the statue was a representation of Hippolytus himself. The statue was subsequently given an idealized head and arms and now stands at the entrance of the Vatican Library. Margherita Guarducci (1977) has argued that the figure was in fact female, perhaps a representation of Wisdom (Sophia) or specifically the Epicurean philosopher Themista.

The 16-year table of Paschal full moons contained in this inscription, beginning with the first year of Alexander Severus, is certainly the same as that which Eusebius attributes to Hippolytus. The list of writings on the statue, however, does not overlap with Eusebius' list, except for the Paschal table itself. The identity of the Hippolytus to whom Eusebius attributes a 16-year list is in fact a major problem on which scholars have yet to reach agreement (Cerrato 2002).

[8] For discussion of the discovery and its date, see Brent 1995: 3–50; for the text of the inscriptions, *PG* 10. 875–84; there are photographic reproductions in Brent 1995.

[9] *Historia Augusta*, Severus Alexander 7. 1–2.

ii. The Hippolytan Problem

The name of Hippolytus appears twice elsewhere in the *Ecclesiastical History* of Eusebius. Eusebius says (*HE* 6.20) that during the time of the emperor Caracalla (198–217) there lived several learned churchmen, whose letters and other writings Eusebius was able to consult in the library established at Aelia (the former Jerusalem) by Alexander, who had succeeded Narcissus as bishop in that city. Among these writings were letters and other compositions by Beryllus, bishop of Bostra in Arabia (modern Bosra in Syria), and by Hippolytus, the 'president (*proestos*) of another church somewhere'. Elsewhere (*HE* 6. 46), Eusebius says that Dionysius of Alexandria sent a letter to the Roman church, using one Hippolytus as a courier. Eusebius does not quote from the letter nor explicitly state its subject, but he does say that Dionysius wrote several letters on the subject of repentance for those who had lapsed during the recent persecutions.

St Jerome knew little more about Hippolytus than did Eusebius. In his collection of short biographies, arranged in rough chronological order, Jerome lists Hippolytus after Beryllus and before Alexander (*De viris illustribus* 61). Jerome gives a more extensive list of the writings of Hippolytus than Eusebius, including commentaries on the Psalms, Isaiah, Daniel, Revelation, Proverbs, and Ecclesiastes.

Like Eusebius, Jerome states that he was unable to ascertain of what church Hippolytus was the bishop. From as early as the sixth century, however, Byzantine authors cite a number of exegetical texts as being the work of 'Hippolytus of Rome'. Leontius of Byzantium (*c.*550), quotes from a book on the Oracle of Balaam by Hippolytus 'bishop and martyr' (*PG* 86. 1312). John of Damascus (*c.*725) quotes from a work 'On Christ and Anti-Christ' by 'Hippolytus bishop of Rome' (*PG* 96. 525). Several fragments of a commentary on the Book of Genesis are attributed to 'St Hippolytus bishop of Rome' (frr. 1–4, ed. Achelis). The patriarch Photius, in his catalogue of the library at Constantinople in the ninth century, has two entries for Hippolytus (*Bibl. cod.* 121, 202). In the first, he says Hippolytus was a student of Irenaeus and a contemporary of Origen and was the author of a work 'Against the 32 Heresies'. In the second, he says Hippolytus was a 'bishop and martyr', who wrote a commentary on Daniel and a book 'On Christ and Antichrist'. Substantial portions of the commentary on Daniel have survived, attributed in the manuscripts to 'Hippolytus bishop of Rome'.

A list of the early bishops of Rome preserved in the *Chronograph of 354* does not include any Hippolytus as bishop. That list (Mommsen 1892: 74–5) does associate one 'Hippolytus the presbyter [priest]' with Pontianus, who became bishop during the reign of Alexander Severus in the consulship of Pompeianus and Pelignianus (AD 231). Pontianus and the presbyter Hippolytus were deported to Sardinia, in the consulship of Severus and Quintianus (235), where Pontianus died on 28 September. A calendar of martyrs' days in the same work lists for 13 August 'Hippolytus at the cemetery on the Via Tiburtina' and 'Pontianus at the cemetery of Callistus' (Mommsen 1892: 72).

To complicate matters, several Byzantine writers refer to Hippolytus as bishop, not of Rome, but of Portus. The *Chronicon Paschale* (*c.*630) quotes (12. 22–13. 1) from a composition 'Against all Heresies' as the work of 'Hippolytus the martyr, bishop of a place called Portus near Rome'. George Syncellus (*c.*800) gives a list of works (438. 7–16) that he attributes to 'Hippolytus the holy philosopher, bishop of Portus at Rome'. The list is similar to that of Eusebius, but adds commentaries on Daniel and Revelation. Elsewhere (381. 23–4), Syncellus includes 'Hippolytus the holy martyr and apostle, archbishop of Rome' among those who dated the Nativity to the year 5500 or 5501 of the world. Zonaras (*c.*1100) says that Hippolytus was a learned man who wrote many commentaries and served as bishop of Portus when Urban was bishop of Rome (*Epitome historiarum*, iii. 123). Nicephorus Callistus (*c.*1300), in his *Ecclesiastical History* (4. 31, *PG* 145. 1052), says that 'Hippolytus bishop of Portus at Rome' flourished in the time of Alexander Severus. He gives a list of works fuller than that of Syncellus.

Portus was the harbour of Rome during the imperial period, a short distance up river from Ostia in the Tiber delta. One of the earliest references to Hippolytus of Portus comes from the Latin poet Prudentius (*c.*400), who wrote an encomium (*Carmen* 11) on the Passion of St Hippolytus, whose shrine on the Via Tiburtina he visited. Although Prudentius does not refer explicitly to Portus, he does say that Hippolytus was martyred at a place near the mouth of the Tiber (*ostia per Tiberina*). Excavations at Portus have shown that there was a church dedicated to Hippolytus the martyr from as early as the fourth century' (Brent 1995: 385–6). A sarcophagus bears an inscription of the ninth century reading: *hic requiescit beatus Ypolitus mar<tyr>*. The poem of Prudentius seems to combine elements of several different traditions. How many persons named Hippolytus are at the root of these cults and the traditions arising from them remains the subject of scholarly debate.[10]

Among the works that Eusebius and Jerome attribute to Hippolytus is a 'Refutation of All Heresies'. The author of the *Chronicon Paschale* cites from a book of similar title as being the work of Hippolytus, 'Bishop of Portus near Rome'. No such title appears in the list of works on the statue. In 1841, Minoides Mynas discovered at Mt. Athos and transported to Paris a fourteenth-century

[10] Döllinger 1853, pp. 28–63 in the English translation; Cerrato 2002: 3–13.

manuscript containing books 4–10 of a treatise entitled 'Refutation of All Heresies'.[11] In the margin of the manuscript are the words 'Origen and his opinions'.

The first book of such a work had long been known. It is preserved in four manuscripts that attribute the text to Origen and entitle it either 'Philosophoumena' or 'Refutation of All Heresies'. Emmanuel Miller connected the newly discovered manuscript with the previously known fragment and published it in 1851 as the 'Philosophoumena' of Origen. Yet Origen cannot have been the author. In the prologue to the first book, the author identifies himself as a member of the 'high priesthood'. If the phrase is a reference to the episcopate, then it excludes Origen as author. Origen's claim even to the priesthood is tenuous. More significantly, in books 9 and 10, the author describes his personal opposition to Pope Zephyrinus of Rome (198–217) and his successor Callistus (217–22), whom the author regards as thoroughly corrupt men unworthy of the office of bishop. Clearly, the author is a member of the Roman clergy.

Johann von Döllinger (1853) identified the treatise as the work of Hippolytus. Döllinger regarded the martyr of Portus as a different person and connected the author instead with the presbyter Hippolytus mentioned in the *Chronograph of 354*. Döllinger argued that Hippolytus was elected bishop of Rome by a faction in opposition to Callistus, but was eventually reconciled with Pontianus. Theodor Mommsen (1892: 85 n. 1) thought the hypothesis of Hippolytus as anti-pope of dubious merit. Nevertheless, Döllinger's influence was such that one will in fact find Hippolytus listed in the Library of Congress cataloguing system as 'Hippolytus, Antipope, *circa* 170–235 or 6'.[12]

One of the works listed on the statue is an 'Apostolic Tradition'. Eduard Schwartz (1910) identified this title with the liturgical treatise formerly known, through a Coptic translation, as 'The Egyptian Church Order'. According to Schwartz, the text reflects Roman interests and probably originated in the third century. Some redactions associate the name of Hippolytus with the text. This work has become the single most important source for the modern liturgical reform movement.[13] Papal decrees authorizing new rites specifically cite Hippolytus as an authority.[14]

In an effort to unify all of this evidence, some scholars have supposed that Hippolytus was of eastern, perhaps (like Beryllus) of Arabian origin, travelled to Alexandria, and eventually relocated to Rome, where he was ordained as

[11] On Minoides Mynas see Omont 1916.

[12] http://catalog.loc.gov, accessed 2 Dec. 2005.

[13] Hanssens 1959; Bradshaw 1992.

[14] For example, '*Pontificalis Romani recognitio*—Approval of New Rites of Ordination', promulgated 18 June 1968, by Pope Paul VI.

presbyter, later became bishop of Portus, and was recognized by some as bishop of Rome in opposition to Callistus.[15]

In recent decades, this scholarly construct of a Hippolytus who was the author of a large body of work and the most important theologian of the third-century Roman church has begun to crumble. Pierre Nautin (1947) argued that most of the writings attributed to Hippolytus, especially such exegetical works as the *Commentary on Daniel*, were the work of an eastern bishop. The 'Refutation against All Heresies' he attributed to an obscure Roman presbyter named Josippos.

This hypothesis won little immediate support. Marcel Richard (1950, 1951), among others, defended the traditional view. Beginning in the 1970s, however, the idea of dividing the Hippolytan corpus between two authors began to gain support. V. Loi (1977) argued that Eusebius was referring to two separate authors. One was an eastern writer who was a contemporary of Beryllus of Bostra and the author of several biblical commentaries, including the extant commentary on Daniel. The other was the Hippolytus to whom Eusebius attributes the 16-year table and the 'Against all Heresies'. More recently, Allen Brent (1995) has attributed the exegetical texts to an eastern Hippolytus and argued that the works listed on the statue were the product of a 'school' of writers who took the name of Hippolytus. J. A. Cerrato (2002) has published a thorough history of the whole question and argued in favour of Loi's point of view. Whether the extant versions of the 'Egyptian Church Order' should be attributed to either of these persons has been seriously challenged.[16]

The unitary view of a single Hippolytus of eastern origin who also worked in Rome still has its defenders (Frickel 1988). In the present study, I will be concerned with the *Commentary on Daniel* and the *Chronicle*, as well as the Paschal table. I take the position recently advocated by Osvalda Andrei (2006) that these three works, at least, are the product of the same person. I think it likely that this person was, as Andrei maintains, of eastern provenance and someone different from the author of the 'Refutation'.

iii. The Paschal Table

On the right side of the statue, there are seven parallel 16-year columns, a total of 112 years. In the leftmost column is the calendar date of the Paschal full moon, beginning with 13 April, and ending with 25 March. The dates repeat beginning at the ninth year, so there are two 8-year cycles, rather than a true

[15] For references, see Cerrato 2002: 114–15.

[16] Bradshaw et al. 2002; Baldovin 2003.

16-year cycle. To the left of the calendar date, years that are embolismic or bissextile are so marked. To the right of the date is a Greek letter from alpha (1) to zeta (7) indicating the day of the week on which the Paschal full moon falls. The remaining six columns show only the day of the week, since the calendar dates will repeat every sixteen years. There are some notes next to these weekday numerals, including one for the birth of Christ at year 2 and one for the Passion at year 32. To the left of the statue is a list of dates for Easter Sunday for seven 16-year cycles.

Hippolytus believed that both the Paschal moon and Easter Sunday would return to the same calendar date in a period of 112 years. Hence the notes at years 2 and 32 indicate that Jesus was born two periods earlier in the year corresponding to 2 BC and that he suffered in AD 29. The other notes refer to observances of the Passover 'in the desert' and in the times of Joshua, Hezekiah, Josiah, and Ezra.

The reason for considering the 112 years as consisting of seven 16-year cycles, rather than fourteen 8-year cycles is that any date in the Julian calendar moves back by one day of the week every sixteen years (Holford-Strevens 1999: 805). Thus 13 April, the first date in the list, was a Saturday in AD 222, a Friday in AD 238, Thursday in AD 254. As shown in Table 2, the top row of the matrix, translated into Arabic numerals, reads: '7 6 5 4 3 2 1'. After seven cycles, 13 April will again be Saturday, a 7.

The idea of this 112-year period may be Roman, but the underlying 8-year cycle is probably Alexandrian, having been communicated to Rome by Demetrius of Alexandria in his Paschal letters.[17] The fact that the cycle begins in the year 222, while Demetrius is said to have 'invented the epacts' in the year 214, supports the view that the Paschal table of Hippolytus represents an Alexandrian 8-year cycle. There is no column for the epact. Hippolytus (and, for that matter, Demetrius) could have produced an 8-year cycle simply by adjusting the method of subtracting 11 or adding 19, so as to take account of leap year. In a leap year, he would subtract 12 or add 18. Hippolytus might have chosen 13 April for the head of the cycle because it is the latest date for the 14th day of the moon that will produce a date for Easter Sunday in conformity with the Roman rules, regardless of the day of the week on which 13 April falls.

Nevertheless, it seems more likely that the Hippolytan cycle was based on a system of epacts. A 14th day of the moon on 13 April entails a 1st day of the moon on 1 January. Thus, the cycle would begin from the new moon of 1 January, with epact 1. In addition, years that are embolismic are so marked in the table. An embolismic year is one in which a 13th lunar month is added to

[17] Schwartz 1905: 29; Richard 1974: 309; Neugebauer 1979*a*: 85–7, 93.

Table 2. The 112-year cycle of Hippolytus

Year	14th Day	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6	Cycle 7
1	13 April	7	6 a	5	4	3	2	1
2	2 April	4 b	3	2	1	7	6	5
3	21–2 March	1 c	7	6 d	5	4	3	2
4	9 April	7 e	6	5	4	3	2	1
5	29 March	4	3	2	1	7	6	5
6	18 March	1	7 f	6	5	4	3	2
7	5 April	7	6	5	4 g	3	2	1
8	25 March	4	3	2	1	7	6	5
9	13 April	3	2	1	7	6	5	4
10	2 April	7	6	5	4	3	2	1 h
11	21–2 March	4	3	2	1	7	6	5
12	9 April	3	2	1	7	6	5	4 i
13	29 March	7	6	5	4	3	2	1
14	18 March	4	3	2	1	7	6	5 j
15	5 April	3 k	2	1	7	6	5	4
16	25 March	7	6 l	5	4	3	2	1

Numerals indicate the weekday of the 14th day of the moon. For explanation of the double date at years 3 and 11, see the text.

Lower-case letters indicate the position of chronological notes in the inscription, as follows.

a Ezra according to Daniel and In the desert
b Birth of Christ
c Hezekiah
d Joshua
e Josiah
f Hezekiah according to Daniel and Josiah
g Joshua according to Daniel
h Exodus
i In the Desert
j Ezra
k Exodus according to Daniel
l Passion

make up the differential between lunar years of 354 days and solar years of 365¼ days. The cycle seems therefore to have been based on a theoretical 8-year luni-solar cycle and a system of epacts, rather than on empirical discovery of such a cycle through the method of subtraction and addition. In the table that follows, I therefore supply a column for the epact, defined as of 1 January, which is the lunar equivalent of 1 March. Since the *Computus* that the Ethiopic sources attribute to Demetrius began eight years earlier, in AD 214, presumably with a 14th moon on 17 Pharmouthi = 13 April, we may assume that Demetrius also used the Roman calendar, at least for the purposes of a table to be communicated to bishops outside of Egypt. For internal purposes, he would have used the Alexandrian calendar, and I supply also therefore the Alexandrian epact defined as of the last epagomenal day.

Table 3. The first 16-year cycle of Hippolytus

Year AD	Epact Roman	Epact Alexandrian	Embolismic Bissextile	Moon 14	Weekday	Note	Easter
222	1	22	E	13 April	7	—	21 Apr
223	12	3	—	2 April	4	Birth of Christ	6 Apr
224	24	15	B	21–2 M	1	Hezekiah	28 Mar
225	5	26	E	9 April	7	Josiah	17 Apr
226	16	7	—	29 Mar	4	—	2 Apr
227	27	18	—	18 Mar	1	—	25 Mar
228	9	30	EB	5 April	7	—	13 Apr
229	20	11	—	25 Mar	4	—	29 Mar
230	1	22	E	13 April	3	—	18 Apr
231	12	3	—	2 April	7	—	10 Apr
232	24	15	B	21–2 M	4	—	25 Mar
233	5	26	E	9 April	3	—	14 Apr
234	16	7	—	29 Mar	7	—	6 Apr
235	27	18	—	18 Mar	4	—	22 Mar
236	9	30	EB	5 April	3	Exodus	10 Apr
237	20	11	—	25 Mar	7	—	2 Apr

The first three columns are extrapolated and supplied. The date of Easter Sunday does not appear in the portion of the inscription showing the 14th day of the moon and its weekday. That date has been added in the last column from the 112-year list of Easter Sundays elsewhere in the inscription.

Table 3 shows that the 'leap of the moon', a differential in the epact of 12 from the previous year, instead of 11, occurs in the third and seventh years of the 8-year cycle, coinciding with leap year. At years 3 and 11 of the 16-year cycle, the inscription expresses the date of moon 14 as 21–2 March. Without the *saltus*, the Roman epact would be 23, and moon 14 would fall on 22 March. Because it is a leap year, the epact is 24 on 1 March and moon 14 falls on 21 March. That the effective date of moon 14 in this year of the cycle is 21 March, not 22 March, follows from the date for Easter Sunday in (for example) year 35 (AD 256), on 23 March. If Moon 14 were on 22 March, the rule evident elsewhere in the table, which restricts Easter Sunday to moon 16 through 22, would require postponement from 23 March to 30 March. At years 7 and 15 of the 16-year cycle, which are also leap years, the inscription has moon 14 on 5 April. The reason the date is not given as 4–5 April is, presumably, that these are embolismic years (cf. Schwartz 1905: 35, n. 1).

The earliest possible date for Easter Sunday in the Hippolytan table is therefore 20 March, in years when 18 March is a Friday. Those dates appear in the 112-year list for the year corresponding to AD 259 and again for AD 315. The latest possible date for Easter would occur in years when the 14th day of the moon falls on Saturday, 13 April, leading to an Easter date of 21 April, as in the first year of the table. This is consistent with the later Roman rule prohibiting the observance of Easter after 21 April.

No rule is in effect here restricting either Easter Sunday or the 14th day of the moon to a date on or after the equinox. That date was 25 March in the Roman calendar.[18] In Alexandria, the conventional date for the equinox was 21 March (see Ch. 8). The earliest evidence for a rule of the equinox is the statement of Eusebius (*HE* 7. 20) that Dionysius of Alexandria put forth a rule that 'not otherwise than after the spring equinox is it proper to observe the Paschal feast'. If the 8-year cycle of Hippolytus represents that of Demetrius, Dionysius would have found it necessary to make only one change in order to accommodate the new rule. He would have needed to place the Paschal moon of the sixth year on 17 April instead of 18 March. That change would in turn have required making that year embolismic, instead of the following year.

Richard (1966, 1974) has argued that Heraclas, who succeeded Demetrius as bishop of Alexandria in 231, had already made minor changes in the cycle and that Dionysius instituted a more thorough reform. His understanding of the structure and history of the 8-year cycle is, however, highly speculative and rests largely on inferences drawn from the 112-year table composed in AD 243 that the evidence of that text cannot in fact support.

3. THE 112-YEAR TABLE OF AD 243

In 1682, the Oxford mathematician John Wallis published another version of a Paschal table based on the 112-year cycle, falsely attributed to St Cyprian of Carthage and now usually referred to as 'Pseudo-Cyprian' or 'the computist of 243'.[19] The text consists of a lengthy preface followed in one of the manuscripts (now apparently lost) by a badly corrupted list of dates that may or may not represent the original author's intentions.

At the end of the preface, the author counts 215 years from the Passion to the fifth year of the emperor Gordian, the consulship of Arrianus and Papus, AD 243. He states (*PL* 4. 967–8) that at the third line of the first 16-year cycle the Jewish Passover occurs on Tuesday, 21 March, and the Christian festival on Sunday, 26 March. Again, those dates correspond to the year 243. In the main text of the preface (*PL* 4. 949–53), the author uses a different numeration. He begins from the anniversary of the first Passover in Egypt, which he

[18] Columella, *de re rustic.*1. 14; Pliny, *nat. hist.* 2. 81.

[19] Reprinted *PL* 4. 942–72; for discussion, see Schwartz 1905: 36–40, and Ogg 1947, 1954, 1955.

says took place on the 14th day of the moon and the 12th day of April. He then numbers the sixteen years of the cycle, beginning with 1 April. The following seven years have the Passover full moon on 21 March, 8 April, 28 March, 17 March, 5 April, 24 March, 12 April. The cycle returns to 1 April in the ninth year. He specifically says that the third year is a leap year. Thus the third year must be 244, not 243. The explanation for the apparent discrepancy is that the author based his calculations on the Passover of the Exodus, but the Passover cycle itself begins in the following year. When he says the third 'line' has the 14th moon on 21 March, he uses the word *versus*. When he says the third 'year' has the Passover moon on 8 April, he refers to the *pinax*. Thus the first line (*versus*) of his list began with 12 April, but the first year of his cycle (*pinax*) began with 1 April (Schwartz 1905: 36).

The cycle has a base-date different from that of Hippolytus, and the epacts of the moon also are different. In the table of Hippolytus the Paschal full moon for the year 243 was Saturday, 18 March, in the 7th year of the cycle, not Tuesday, 21 March, in the third year of the cycle. The difference in the base-date derives from the author's calculations for the date of the Exodus. The difference in the epact, as Schwartz suggested, derives from correction for the error of 1½ days in the phases of the moon in an 8-year cycle. The author added three days to the epacts of Hippolytus to account for this difference during the 20 years that had elapsed since the first year of Alexander Severus.

The author criticizes the methods of some of his predecessors, who calculate 'according to the lunar epacts' (*PL* 4. 949–50). He prefers to calculate in the same way that God instructed the Jews, by either adding 19 days (sometimes 18) from one Paschal moon to the next or subtracting 11 days in order to avoid placing the observance in the second month. He defends a date for the Paschal full moon as early as 17 March by appealing to the facts of creation (*PL* 4. 947–8). God created the world on a Sunday at the time of the vernal equinox, 25 March. The moon was created full, in its 15th day, on Wednesday, 28 March. The first year would not have been embolismic, so if one counts 354 days from 28 March, one will find that the full moon of the first month in the next year falls on 17 March.

We do not know to whom the author was referring when he criticized calculation by the epacts. Most likely, the reference is to Hippolytus, although some of the author's other complaints may have been directed elsewhere (Ogg 1947). The computist of 243 preferred to accumulate 11¼ days each year on 28 March, the beginning of the true solar year, rather than to intercalate a whole day every four years in February (*PL* 4. 948). He also attributes to certain of his predecessors a calculation with limits for the Passover moon between the Ides of March (15 March) and the Ides of April (13 April). When, he says (*PL* 4. 945–6), the subtraction of 11 days from the previous year's date would pass the limit of 15 March, they would add 19 days instead to arrive at 13 April. This statement fits the 8-year cycle that Hippolytus used.

Like Hippolytus, the computist of AD 243 looked for cyclical correspondences between events at intervals of 112 years. The first year of the table corresponds to the Exodus after a period of 1792 years ($112 \times 16 = 1792$). The author says (*PL* 4. 963–4) that the day of the Nativity will be found in the 13th year of the sixth 16-year period, on the fifth day before the Kalends of April (28 March), and the fourth day of the week (Wednesday). He remarks on the providential fact that Christ was born on the same calendar date and the same day of the week that the sun was created. The 13th year of the sixth period, if 28 March is a Wednesday, would be AD 333, which implies a date for the Nativity 21 cycles or 336 years earlier in the year corresponding to 4 BC. The date is consistent with the author's date (*PL* 4. 953) for the Passion on Friday, 9 April, 215 years before the consulship of Arrianus and Papus, AD 28. The interval makes Jesus 31 years old at the time of his death.

4. THE HISTORY OF THE 8-YEAR CYCLE

We do not know where the computist of AD 243 wrote his tract or whether anyone ever put his cycle into effect. At Rome, the 112-year period of Hippolytus was soon supplanted by an 84-year cycle (see Ch. 11). At Alexandria, a 19-year cycle was certainly in use by the time of Athanasius (see Chs. 8 and 9). This cycle was introduced by Anatolius, an Alexandrian polymath who was a contemporary of Dionysius and subsequently became bishop of Syrian Laodicea. The 19-year cycle of Anatolius began in AD 258, although it may not have been introduced until several years later.

The earliest actually attested date for the observance of Easter at Alexandria comes from a fragment of a Paschal letter, first published in 1973, in which Peter of Alexandria sets the date for Sunday, 10 April, the 15th day of Pharmouthi (Richard 1973: 267). Eusebius says (*HE* 9. 6) that Peter was beheaded during the persecutions of Maximin that followed upon the death of Galerius in 311. The *Chronicon Paschale* (514. 7) gives him twelve years in office.

During the period of Peter's episcopacy, only in AD 309 was 10 April a Sunday. For that year, the cycle of Anatolius would have prescribed a 14th moon on 10 April. By the usual rule that Easter should be postponed a week when the 14th day of the moon falls on a Sunday, the festival ought not to have been observed until 17 April. Richard (1974: 307) maintained that Peter must therefore have calculated this date on the 8-year cycle. In that year, the 8-year cycle as Richard reconstructs it prescribed the 14th day of the Passover moon on Saturday, 9 April, so that an observance of Easter could indeed follow on the 10th.

The year AD 309 corresponds to the last of an 8-year cycle as we know it from Hippolytus. If that was the cycle of Demetrius and if it had remained in effect unchanged until as late as 309, then the 14th day of the moon would have been scheduled for Friday, 25 March, with Easter on 27 March. The error in the 8-year cycle is such that Easter on that date would have coincided approximately with the astronomical new moon, instead of the full moon. Richard derives his date for the 14th day of the moon on 9 April, an approximately correct astronomical date, by supposing that the 8-year cycle had been reformed in such a way as to correct for its errors.

Richard believes (1974: 309–10) that the *antecessores* to whom the computist of 243 refers include Demetrius. The author says that these predecessors set limits for the 14th day of the moon between the Ides of March and the Ides of April. Richard takes the statement as being literally precise. He attributes to Demetrius an 8-year cycle beginning with 13 April in the year corresponding to AD 222, and ending with 25 March for the year 229. This was the cycle on which Hippolytus based his 16-year cycle and 112-year period. Demetrius then, according to Richard, sent to Rome another cycle for the next 8-year period, beginning with a 14th moon on 15 March for the year 230 and ending with 26 March for 237, thus causing the moon to advance by one day in each year in comparison with the previous cycle.

Richard proceeds to reconstruct hypothetical 8-year cycles down to the year AD 389. The age of the moon advances in alternate cycles by one or two days with respect to the previous cycle. The result is a period of 160 years after which the 14th day of the moon returns to 13 April in AD 382. He claims that this cycle was in effect at Alexandria until 322 and in Rome perhaps until the 340s.

There is no evidence to support this hypothesis of an 8-year cycle that was not in fact cyclical except after ten iterations that were not really iterations. Richard's attribution to Demetrius of a cycle beginning with 15 March in the year 230 takes the statement of the computist of 243 too literally. It is entirely possible to have a rule that the 14th day of the moon may not recede earlier than 15 March without actually ever prescribing a 14th day of the moon for that date. It may well be the case that the bishops of Alexandria during the period between the 220s and the 260s made adjustments to the 8-year cycle to bring it into better agreement with the phases of the moon. That they did so as systematically or for as long as Richard proposes is unlikely. As Otto Neugebauer commented (1979*a*: 85), there is 'no evidence for a consistent application of such a scheme and, at any rate, it is certainly not part of the cycle of Hippolytus'.

Peter's date for Easter on Sunday, 10 April AD 309, a 14th day of the moon in the cycle of Anatolius, shows not that Peter used some other cycle but that the cycle of Anatolius—like any cycle then and for many years to come—was a tool, not a prescriptive law. It is possible that Anatolius did indeed consider the 15th day of the moon as the earliest appropriate date for Easter. Nevertheless, as Holford-Strevens (2001) has pointed out, at Alexandria no rule prohibiting the observance of Easter on the same day as the Passover was yet in effect. Constantine's decree prohibiting the observance of Easter 'in accordance with the custom of the Jews' was first promulgated after the Council of Nicaea in 325 (see Ch. 3).

Peter was bishop of Alexandria during the Great Persecution. He may or may not have been in the city with access to his Easter tables when he wrote the Paschal letter for 309. The Roman 84-year cycle, if it was in effect at that time, prescribed 17 April for that year (see Ch. 11 and Table 8). Why Peter chose 10 April, we do not know. That date certainly offers no basis for claiming that the 8-year cycle remained in effect at that time.

8

The 19-Year Cycle of Anatolius

1. ANATOLIUS OF ALEXANDRIA AND LAODICEA

At the end of his seventh book (*HE* 7. 32), Eusebius remarks upon several men who were among the most learned of his own time. As well as his own teacher Pamphilus, this group included Anatolius. Eusebius says that Anatolius was an Alexandrian by birth and one of the most eminent scholars of the time. He excelled in mathematics, astronomy, physical science, philosophy, and rhetoric. At the invitation of his fellow citizens, he founded a school of Aristotelian philosophy at Alexandria. He left Alexandria and was consecrated bishop by Theotecnus, who wished Anatolius to be his successor at Caesarea in Palestine. For a time, Anatolius and Theotecnus administered that church together. While Anatolius was travelling to Antioch to attend a synod there that was dealing with the problem of Paul of Samosata, he passed through Laodicea, where the bishop Eusebius had recently died. The people proclaimed Anatolius as their bishop. Eusebius of Laodicea was himself of Alexandrian origin. He too had gone to Syria because of the dispute about Paul of Samosata and was detained by the people of Laodicea to become their bishop.

i. The Siege of Bruchium

Eusebius tells a story about how Anatolius and this Eusebius of Laodicea, while both were still in Alexandria during the siege of Bruchium, arranged for the escape of a large number of citizens from Bruchium to the Roman side. Eusebius was in the part of the city held by the Romans. Anatolius was in the area of the city that was in rebellion. Anatolius was unable to persuade a council of the Alexandrians to desist from the rebellion, but he did convince them to permit the old men, the women, the children, and other non-combatants to depart.

The chronology of these events is problematic. Eusebius says that both Anatolius and Eusebius were in Alexandria during the siege of Bruchium and that it was after that war that the two men departed from Alexandria. In the

Chronicle (p. 221 Helm), Eusebius dates the fall of Bruchium to 270/1. That date is consistent with the statement of the Roman historian Ammianus Marcellinus (22. 16. 12) that it was during the reign of Aurelian that civil war broke out in Alexandria and the district of Bruchium was destroyed. It is also consistent with the notices of Eusebius in the *Chronicle* (pp. 223–3 Helm) for the 'fame' of Eusebius as bishop of Laodicea in 274 and that of Anatolius in 279. Aurelian became emperor in 270 and served for five years and several months, although Jerome's version of the *Chronicle* of Eusebius does not enter his first year until 272.[1]

This sequence of dates seems to be internally consistent. Yet Eusebius also says that it was while Anatolius was en route to a council at Antioch that Eusebius of Laodicea died and Anatolius was elected in his place. In the *Chronicle* (p. 221 Helm), Eusebius dates the council at which Paul of Samosata was deposed and Domnus appointed in his place to the year 268/9. In the *Ecclesiastical History* (7. 30), he reports the death of the emperor Gallienus, the brief reign of Claudius Gothicus, and the accession of Aurelian. He then says it was 'at that time' that the last of the meetings of the council took place. He adds that when Paul refused to step down at Antioch it was to the emperor Aurelian that his opponents appealed.

The date of the council at Antioch in 268/9 seems secure (Millar 1971). Eusebius quotes at length from the synodal letter and says that the letter was addressed to Dionysius of Rome and Maximus of Alexandria, but distributed widely. The list of bishops of Rome preserved in the *Chronograph of 354* dates the accession of Dionysius to the consulship of Aemilianus and Bassus, AD 259, and his death to the consulship of Claudius and Paternus, AD 269 (Mommsen 1892: 75). If Dionysius of Rome was still alive at the time that the council of Antioch drafted its letter, then that council must have taken place no later than 268/9. If it was to Aurelian that Paul's opponents appealed, then the council must have met not long before his accession in 270.

Eusebius says that there was a series of meeting at Antioch to deal with the problem of Paul. At the beginning of the controversy, Dionysius of Alexandria must still have been alive. Eusebius says (*HE* 7. 27–8) that Dionysius was invited to a meeting, but declined on grounds of age and ill health. He dates the death of Dionysius of Alexandria to 265 (*Chronicle*, p. 221 Helm). That first meeting must therefore have been summoned in 264.

The usual reconstruction is that proposed by Louis-Sébastien Le Nain de Tillemont (1690–1738: iii. 345).[2] Eusebius left Alexandria to attend that first

[1] *Consularia Constantinopolitana*, Mommsen 1892: 228–9; *Historia Augusta*, Aurelian 37; Jerome, p. 222 Helm.

[2] McGiffert 1890: 321, citing Tillemont.

meeting on behalf of Dionysius and was made bishop of Laodicea at that time. Anatolius also left Alexandria during the 260s and became bishop coadjutor at Caesarea. It was on the occasion of the final meeting at Antioch in 268/9 that Anatolius travelled to Syria and succeeded his old friend Eusebius at Laodicea.

On this view, the siege at Alexandria in which both Eusebius and Anatolius participated was not the one to which Ammianus refers during the reign of Aurelian, but took place during an earlier war. Eusebius of Caesarea does refer to an earlier period of factional strife at Alexandria, for which his source was one of the Paschal letters of Dionysius. In that letter, which Eusebius quotes at length (*HE* 7. 21), Dionysius says it would be easier to traverse the entire empire than to get from one part of Alexandria to another. In another Paschal letter (*HE* 7. 22), Dionysius says that an epidemic fell upon the city shortly after the end of the war.

The war to which Dionysius refers can most plausibly be connected with the rebellion of Aemilianus, the prefect of Egypt.[3] The *Historia Augusta* (Thirty Tyrants 22. 4–8) says that Aemilianus seized the imperial power for himself, with the support of the army in Egypt. The emperor Gallienus sent the general Theodotus, who put down the rebellion. Gallienus became sole emperor upon the death of his father Valerian in 260 and ruled until 268.[4] Thus, on the usual view among scholars, Anatolius was in Alexandria when Bruchium was under siege during the revolt of Aemilianus about 262 and left soon thereafter to become bishop coadjutor in Caesarea.

According to this reconstruction of the chronology, the notices of Eusebius in the *Chronicle* for the fame of both Eusebius and Anatolius as bishops of Laodicea in the 270s are erroneous; and the note on the fall of Bruchium in 271 refers to a war different from the siege of Bruchium that Eusebius mentions in the *Ecclesiastical History*. Such a conclusion is improbable.

The *Chronicle* and the *Ecclesiastical History* are closely related works. There has been much scholarly discussion about the dates of their original composition and subsequent revision. There is general agreement, however, that Eusebius completed the first edition of the *Chronicle* before the *Ecclesiastical History*.[5] Richard Burgess (1997) has recently argued that Eusebius completed the *Chronicle* shortly after the end of the Great Persecution in 311 and used the skeleton of that work as an outline for the *Ecclesiastical History*.

The sequence of events in the *Chronicle* is fully consistent with what Eusebius says in the *Ecclesiastical History* about the siege of Bruchium and

[3] McGiffert 1890: 299, 318; Oost 1961.
[4] *Historia Augusta*, The Two Gallieni 21; Eusebius, *Chronicle*, pp. 220–1 Helm.
[5] Schwartz 1909: xlvii–cxlvii; Barnes 1980.

the subsequent careers of Eusebius and Anatolius. In the history, Eusebius says that they both came to Laodicea after the war had ended. In the *Chronicle*, he enters the fall of Bruchium at the year corresponding to 270/1, the episcopacy of Eusebius at Laodicea in 274/5, and the fame of Anatolius at 279/80, synchronous with the second year of Probus, which is correctly the year 277. There is no reason to believe that Eusebius was thinking of different sieges of Bruchium when he was working on the two texts.

ii. The Councils at Antioch

Instead of taking the date of the council of Antioch in 268/9 as grounds for revising the chronology as reported by Eusebius and inventing an earlier siege of Bruchium, we should reconsider the question of whether it was while travelling to (or from) that council that Anatolius was detained at Laodicea. In the now standard reconstruction, deriving from Tillemont, Eusebius was made bishop of Laodicea while returning from the first meeting of the Council of Antioch in 264 and Anatolius while travelling to or from the final meeting in 268 or 269. Yet the historian Eusebius does not actually say that Eusebius was travelling through Syria to attend one of those meetings. He says that Eusebius moved from Alexandria to Syria, 'because of the question of Paul'. Nor does Eusebius say that Anatolius was travelling from Caesarea to attend the council at which Paul was deposed. He says (*HE* 7. 32. 21) that Anatolius was consecrated bishop by Theotecnus of Caesarea, who wished Anatolius to succeed him upon his death. The two men presided over the church together for a short time. 'But the synod which was held to consider Paul's case called him to Antioch, and as he passed through the city of Laodicea, Eusebius being dead, he was detained by the brethren there.'

The assumption that the synod to which Eusebius here refers was the famous synod at which Paul was deposed may not be correct. The letter of that synod mentions Theotecnus himself as present (Eusebius, *HE* 7. 30. 2). If Theotecnus was concerned about the succession at Caesarea when he ordained Anatolius, that event may well have taken place after the Council of Antioch.

The troubles over Paul of Samosata continued for some time after the Council of Antioch deposed him in 268/9. Paul refused to relinquish the building to his successor; and it was to the emperor Aurelian, Eusebius says, that his opponents appealed. Aurelian replied that the building should be the possession of those to whom the bishops of Rome and Italy should write a letter to that effect.

Aurelian became emperor in the summer of 270. It was probably in 272 that he defeated the forces of Zenobia, Queen of Palmyra, and took possession of

Antioch.[6] According to Zosimus (1. 50–3), a historian of the fifth or sixth century, Aurelian then put down a rebellion in Alexandria and returned to Rome. Aurelian might have received and replied to the appeal even before the reconquest of Antioch.[7] It would nevertheless have taken some time for the bishops of Italy to meet and discuss the matter and some months after that for their letter to arrive in Antioch.

There was no doubt at least one and probably there were several gatherings of a synod at Antioch to deal with the problem of Paul between the time of his deposition in 268/9 and the final decision by the bishops of Italy some time after 270. There is no reason therefore that it cannot have been in the 270s that Anatolius was travelling from Caesarea to Antioch. Furthermore, the rebellion at Alexandria to which Zosimus refers is no doubt the siege of Bruchium that Ammianus dates to the reign of Aurelian. That rebellion provides a better context for the episode in which the two future bishops of Laodicea were involved than does the rebellion of Aemilianus against Gallienus some ten years earlier.

Eusebius says (*HE* 7. 32. 9) that Anatolius tried to persuade the council of the Alexandrians to 'return into friendship with the Romans'. It is difficult to imagine that the council was in a position to make any such decision during the war between Aemilianus and Theodotus. Both the meeting of the council and the proposal of Anatolius make far better sense in the context of a rebellion of the Alexandrians from the Romans, rather than a war between two rival Roman commanders dividing the city between themselves.

The sequence of events that we meet in the *Chronicle* of Eusebius may therefore be correct. The siege of Bruchium ended in 272. Eusebius could have left Alexandria even before the fall of Bruchium, since he was not in the part of the city that was under siege. He became bishop of Laodicea in 272. Anatolius left Alexandria after the war and went to Caesarea, where he was ordained bishop coadjutor. He was called to Antioch in 273 or 274 to attend one of the synods involved either in sending the appeal to Aurelian or receiving the decision from the Italian bishops. Perhaps Theotecnus was by then too old to make the journey. It was about that time that his friend Eusebius died and Anatolius became bishop of Laodicea.

We do not know how long Anatolius lived after he became bishop of Laodicea. Eusebius says (*HE* 7. 32. 21–2) that he was succeeded by Stephen, the last bishop of Laodicea before the persecutions. Stephen proved himself a coward during the persecutions and was replaced by Theodotus. Anatolius therefore probably died in the 290s.

[6] *Historia Augusta*, Aurelian 25; Millar 1971: 9–10, 16.

[7] Millar 1971: 15–16.

2. THE PASCHAL CANON OF ANATOLIUS

i. The Fragment Quoted by Eusebius

Anatolius wrote 'not many' books, Eusebius says, but enough to demonstrate that he was a man of great and diverse knowledge. These works included an 'Elements of Arithmetic' in ten books and a book on the Paschal festival from which Eusebius preserves a lengthy quotation (*HE* 7. 32. 14–19). It is in that quotation that we meet for the first time an explicit rule requiring that the Jewish Passover be observed only after the vernal equinox. The text also contains the earliest reference to the use of a 19-year cycle in connection with Paschal calculations. In the following translation (adapted from McGiffert 1890: 319), 'Pascha' represents that Greek word, while 'Passover' translates a Greek word that means literally 'crossing over'. The quotation begins in the middle of a longer discussion. The unexpressed subject of the first sentence was apparently a lunar table of some kind.

(14) From the Canons of Anatolius on the Pascha. 'It has in the first year the new moon of the first month, which is the beginning of every cycle of nineteen years, on the twenty-sixth day of the Egyptian month Phamenoth, but according to the months of the Macedonians, the twenty-second day of Dystros, or, as the Romans would say, the eleventh before the Kalends of April. (15) On the twenty-sixth of Phamenoth, the sun is found not only entered upon the first segment, but already passing through the fourth day within it. This segment is called the first twelfth, and the equinox, and the beginning of months, and the head of the cycle, and the starting-point of the planetary circuit. But they call the one preceding this the last of months, and the twelfth segment, and the final twelfth, and the end of the planetary circuit.

Wherefore we maintain that those who place the first month in it, and determine by it the fourteenth of the Pascha, commit no slight or common blunder. (16) And this is not an opinion of our own; but it was known to the Jews of old, even before Christ, and was carefully observed by them. This may be learned from what is said by Philo, Josephus, and Musaeus; and not only by them, but also by those yet more ancient, the two Agathobuli, surnamed Masters, and the famous Aristobulus, who was chosen among the seventy interpreters of the sacred and divine Hebrew Scriptures by Ptolemy Philadelphus and his father, and who also dedicated his exegetical books on the law of Moses to the same kings.

(17) These writers, explaining questions in regard to the Exodus, say that all alike should sacrifice the Passover offerings after the vernal equinox, in the middle of the first month. This occurs while the sun is passing through the first segment of the solar, or as some of them have called it, the zodiacal circle. Aristobulus adds that it is necessary at the feast of the Passover, that not only the sun should pass through the equinoctial segment, but the moon also. (18) For as there are two equinoctial segments, the vernal and the

autumnal, directly opposite each other, and as the day of the Passover was appointed on the fourteenth of the month, beginning with the evening, the moon will hold a position diametrically opposite the sun, as may be seen in full moons; and the sun will be in the segment of the vernal equinox, and of necessity the moon in that of the autumnal.

(19) I know that many other things have been said by them, some of them probable, and some approaching absolute demonstration, by which they endeavour to prove that it is altogether necessary to keep the Pascha and the feast of unleavened bread after the equinox. But I refrain from demanding this sort of demonstration from those from whom the veil of the Mosaic law has been removed, so that now at length with uncovered face they reflect like a glass Christ and the teachings and sufferings of Christ. But that with the Hebrews the first month was near the equinox, the teachings also of the Book of Enoch show.

Neither the 'Musaeus' whom Anatolius cites nor the 'Agathobuli' are otherwise known. Aristobulus was a Jewish philosopher of the second century BC. Clement of Alexandria (*Stromata* 1. 22. 150. 1) quotes from a letter he wrote to Ptolemy Philometer (180–145 BC). Any connection of Aristobulus with Ptolemy Philadelphus (282–246 BC) and the legend of the Septuagint translation of the Hebrew Bible is fictional. Eusebius in his *Preparation for the Gospel* (7. 14, 8. 10) quotes from the work of Aristobulus 'On the Mosaic Law', and it is probably from that book that Anatolius drew his information.

Daniel McCarthy has recently identified the most likely sources for the references to Philo and Josephus.[8] In the *Life of Moses* (2. 222–4), Philo says that Moses made the beginning of the vernal equinox the first month of the year and that on the 14th day of that month the festival of the Pasch is held. Josephus in the *Jewish Antiquities* (3. 248) says that the Pascha is offered on the fourteenth day of Nisan, when the sun is in Aries.

Neither of these statements, nor the paraphrase from Aristobulus, implies as much as Anatolius claims. What Anatolius attributes to Aristobulus requires only what Josephus says—that the sun should be in the sign of Aries. Philo's statement requires that the equinox should be within the month of Nisan, but not that the 14th day of the month must follow the equinox.

ii. The Latin Anatolius

McCarthy's comments appear in the context of the first comprehensive study of a Latin text that circulated, perhaps as early as the fifth century, under the title *Liber Anatolii de ratione Paschae*, 'The book of Anatolius on the computation of the Pascha'. St Bede cited Anatolius on the basis of this text.[9] The text

[8] McCarthy and Breen 2003: 85–6.
[9] *DTR* 35; see Wallis 1999: lvii.

was first published by Aegidius Bucher, who regarded it as the genuine writing of Anatolius, in a Latin translation (Bucher 1634: 450–66).

Joannes van der Hagen (1736*a*: 115–41) argued that the text is a seventh-century forgery written in the British Isles to provide an ancient authority in support of local Celtic practices against the Alexandrian calculations that had by then become the general standard. Bruno Krusch (1880: 311–27) published a new edition of the text and endorsed van der Hagen's conclusions, as have most other scholars.[10] With his usual rhetorical flourish, Bartholomew Mac Carthy (1901: cxviii) judged the text 'peerless in the field of fabrication'.

The text consists of a short tract on the calculation of dates for Easter, followed by a lunar table and a 19-year list of dates for Easter, concluding with some additional remarks about the allowable lunar dates for Easter. The lunar table lists the age of the moon as of the Kalends, Nones, and Ides of each month, beginning from moon 1 on 1 January. The 19-year table has three columns. The first gives the weekday and the epact for the Kalends of January, beginning from Sunday and moon 1, the second the weekday and epact for the day of the equinox, beginning from Saturday and moon 25. The third column lists the date and the epact for Easter Sunday, beginning with 16 April and moon 18. By inspection, one can see that the date of the equinox is 25 March, the traditional Roman date. Easter Sunday ranges from the 14th to the 20th day of the moon.

The prefatory treatise begins with a critique of computations based on 16, 25, 30, and 84-year cycles as failing to agree with one another. The text cites Isidore, Jerome, and Clement as being in agreement on the day and time of Easter, despite the difference in their calendars. 'Isidore' is apparently a later interpolation into the text. McCarthy believes that 'Jerome' (Latin *Hieronymus*) is an error for 'Irenaeus'.

The author quotes a passage from Origen to the effect that on Easter Sunday the sun must have passed through the division between light and darkness and no more than seven days should have passed since the full moon. No such passage appears in the extant treatise 'On the Pascha'.

There follows a chapter with a translation of the same text from Anatolius that Eusebius quotes, except that this Latin version does not include the last section (7. 32. 19) of the Eusebian text. The author devotes the next three chapters to defending the lunar limits of 14 to 20 against those in the region of Gaul who would allow Easter Sunday on the 21st or 22nd day of the moon. He then defends an observance on the 14th day of the moon by appealing to the

[10] Anscombe 1898; Turner 1895; Jones 1943: 82–3; Wallis 1999: lvi–lix; for a complete history of the issue see McCarthy and Breen 2003: 19–23.

ancient tradition of Quartodecimanism as deriving directly from the beloved apostle John, who always celebrated Pascha on the 14th day of the moon, once the equinox had passed. The author also, however, accepts the teaching that Easter should be observed on a Sunday. He then states that it is possible to find the correct dates within the short span of a 19-year cycle and that he has done so in the appended tables.

Several more chapters follow the tables. The author defends the 19-year cycle against certain African computists who use a longer cycle and prescribe limits for the Pascha between 22 March and 21 April, not to exceed the 21st day of the moon. The author says that the only rule laid down in the Old Testament is that the Passover is to be offered on the 14th day of the moon, but not before the vernal equinox. Then, responding to a question he says his addressee has raised, the author describes the annual passage of the sun through equinoctial and solstitial points, with the corresponding lengthening or shortening of daylight hours.

The main argument of the tract—that Easter Sunday should be observed between the 14th and the 20th of the moon—fits the context of the seventh-century debate in Britain between local Celtic practices and the practices of the Roman church, with lunar limits between 15 or 16 and 21 or 22. The computists of Gaul whom the author criticizes could be a reference to Victorius of Aquitania. Victorius' tables allowed Easter Sunday as late as the 22nd day of the moon (see Ch. 11). A reference to the calculations of Victorius would mean that the tract cannot have been composed before AD 457.

The best-known incident in these debates about insular versus continental rules for Easter is the Council of Whitby, described in dramatic detail by St Bede in his *History of the English Church and People* at the year AD 664. The issue was precisely whether Easter Sunday could be observed as early as the 14th day of the moon. One of the participants cites this tract of Anatolius as an authority in defence of the British tradition (Bede, *HE* 3. 25).

There is a crucial difference between the text of Eusebius in his quotation from Anatolius and the text of this Latin translation of that same passage. Whereas Eusebius quotes Anatolius as equating the 26th day of Phamenoth with 22 March as the beginning of the 19-year cycle, the Latin text uses the Roman date for the equinox on 25 March.

From these facts, among others, van der Hagen and Krusch argued that this text is a forgery composed by a Scottish or Irish author to provide an ancient authority in support of the local tradition. The forger incorporated into the text the genuine fragment from Anatolius quoted by Eusebius, but changed the date of the equinox from 22 March to 25 March. The remainder of the treatise is a spurious production. A less extreme version of this hypothesis holds that the author did indeed have a copy of the genuine *de ratione Paschali* of Anatolius, but changed the text to suit his purposes.[11]

iii. The Hypothesis of Daniel McCarthy

In 2003, Daniel McCarthy and Aidan Breen published a new critical text of the *Liber Anatolii de ratione Paschali*, with English translation and extensive commentary and analysis. The commentary and analysis represent the culmination of more than fifteen years' work by Daniel McCarthy on the origins of an 84-year Irish Easter table rediscovered in 1985 by Dáibhí Ó Cróinín.[12] Aidan Breen is responsible for the critical text of the *Liber Anatolii*.

McCarthy argues that the 84-year cycle used in Ireland began in the year AD 438, or some interval of 84 years before or after that date, and that Sulpicius Severus (*c*.360–425) was its author. Severus used as a basis for his work the peculiar lunar table found in the *de ratione Paschali*. That lunar table is in turn fully congruent with the principles set forth in the prefatory text. Therefore the *de ratione Paschali* as a whole is a 'cogent, sustained, and well-structured document' that must in its original form have been composed, or translated, no later than the early fifth century.[13] McCarthy further argues that the authorities cited in the text and the references to the Quartodecimans as preserving a genuine apostolic tradition suggest a third-century Asian provenance. Both the tract and its included lunar and Paschal tables are in fact, he concludes, the genuine work of Anatolius of Laodicea, translated from Greek into Latin either by Rufinus of Aquileia or someone in his circle.[14] Rufinus translated the *Ecclesiastical History* of Eusebius into Latin and added a continuation to the year 395.

McCarthy believes that the Latin version is not only independent from Eusebius, but is also more faithful to the text of Anatolius in the passage to which they both attest. St Jerome (*de viris illustribus* 61, 87) states twice that Eusebius himself composed a 19-year cycle. McCarthy argues that Eusebius deliberately obscured and in one crucial phrase purposely distorted the text of Anatolius in order to minimize the extent to which his own cycle differed from that of the esteemed bishop of Laodicea. In addition to Jerome, McCarthy cites an entry in the *Annals of Tigernach* for the attribution to Eusebius of a 19-year Paschal canon. In McCarthy's reconstruction (2003: 138) the entry belongs to the year AD 309.

[11] Strobel 1977: 385–8; id. 1984: 20.
[12] McCarthy and Ó Cróinín 1988; see Ch. 11.
[13] McCarthy 1994; McCarthy and Breen 2003: 23–4.
[14] McCarthy and Breen 2003: 114–18.

Some of McCarthy's arguments for finding in the Latin text a version of the genuine preface of Anatolius are cumulatively persuasive. McCarthy's central claims, however, must be rejected. Whether Eusebius himself was the author of a Paschal canon is a question to which I shall return shortly. Even if so, it cannot be the case that in the critical passage where they disagree it was Eusebius, rather than the author of the Latin tract, who distorted the text of Anatolius.

iv. The Vernal Equinox and the Sign of Aries

The central question that McCarthy addresses is the same upon which scholarly attention has always focused in efforts to reconstruct the Paschal canon of Anatolius. What date did Anatolius recognize as marking the vernal equinox? The quotation from his preface apparently begins in the middle of an argument. The first clause has the conjunction 'therefore'. The subject of the clause is unexpressed, but must be the nineteen year cycle. 'It therefore has in the first year the new moon of the first month—the new moon that is the beginning of the whole 19-year cycle—the 26th day of the Egyptian month Phamenoth, the 22nd of Dystros in the Macedonian calendar, and as the Romans say the 11th day before the Kalends of April.'

In equating 26 Phamenoth with 22 Dystros, Anatolius follows the Macedonian calendar of Antioch, which had been adapted to the Roman calendar such that the old Macedonian names of the months were simply substitutes for the Roman names (Ginzel 1906–14: ii. 31). Thus 22 Dystros is the same date as 22 March, the 11th day before the Kalends of April. Four days is the correct differential between the Alexandrian and Roman calendars in the month of Phamenoth, so that Anatolius rightly states that 26 Phamenoth is the equivalent of 22 March.

Anatolius then explains the appropriateness of the date. 'On the 26th day of Phamenoth, the sun is found not only entered upon the first segment, but already traversing the fourth day in it.' He says that this 'segment' is the one that people call the first of twelve, the segment of the equinox, the beginning of months, the head of the cycle, and the start of the course of the planets. As he explains later in the passage, the twelve divisions of the course of the sun constitute what some people call the 'animal cycle', i.e. the Zodiac.

The revolution of the earth around the sun causes the sun to appear to rise and set against an ever-changing background of stars. The Babylonians divided the night sky into twelve equal parts, each representing 30 degrees of this annual circuit.[15] Each part came to be named after the group ('constellation')

[15] Sextus Empiricus 5. 23–8; Ginzel 1906–14: i. 78–88.

of stars within it, the names being those of various animals. The first sign of the Zodiac is Aries, the 'Ram', the twelfth is Pisces, the 'Fish'. Among the Greeks, the full set of names first appears in the work of Geminus of Rhodes (1. 1) in the first century BC.

To say that the sun is in the sign of Aries means that the sun rises when the constellation of Aries is in the background. Since there are 360 degrees in the Zodiac and 365 days in a year, each degree corresponds roughly to one day. The expressions 'first part', 'first degree', and 'first day' are equivalent. If the sun rises in the fourth day of Aries, this means that the stellar background has moved 4/30 of the distance between the first point of Aries and the first point of Taurus.

If the 26th day of Phamenoth, 22 March, is the fourth day of Aries, then the first day is 23 Phamenoth, 19 March. Since Anatolius designated Aries as the sign of the equinox, some scholars have concluded that Anatolius recognized 19 March as the equinoctial point and constructed his Paschal cycle accordingly.[16] Jones (1943: 21), among others, thought that the equinoctial point for Anatolius was 18 March. A variant reflected in Bede's quotation of the passage makes 26 Phamenoth one-quarter of a day after the entrance of the sun into Aries.[17] By that interpretation the equinox is 21 March.

The usual consensus among scholars now is that Anatolius reckoned the equinox as occurring on 22 March and made that the earliest permissible date for the 14th day of the Passover moon.[18] This inference follows not so much from the Greek text as from the fact that the Alexandrian astronomer Claudius Ptolemy (*Almagest* 3. 1) reports an observation of the equinox at a date in the old Egyptian mobile calendar corresponding to 22 March AD 140. The conclusion therefore is that 22 March was the recognized date of the equinox in Alexandrian astronomy during the second and third century and that Anatolius constructed his Paschal canon accordingly.

Daniel McCarthy agrees that Anatolius must have accepted from Ptolemy a date for the vernal equinox corresponding to 26 Phamenoth in the Alexandrian calendar. He claims, however, that there is 'no known precedent in third-century astronomy' for saying that the sun enters Aries on 19 March, so that 26 Phamenoth = 22 March would be the fourth day.[19] McCarthy cites a passage (*Almagest* 2. 7) where Ptolemy says that he employs the system according to which the divisions of the Zodiac begin at the equinoctial and solstitial points, beginning with Aries at the vernal equinox. McCarthy believes that Anatolius

16 Rühl 1897: 115; cf. Mac Carthy 1901: xlv, Van de Vyver 1957.

17 Bede, *DTR* 6; cf. Bede's letter to Wicthed, Jones 1943: 320 (*PL* 94. 676 B); see Duchesne 1880: 20 n. 3.

18 Schwartz 1905: 15–17; Ginzel 1906–14: iii. 232; Grumel 1958: 31, 36; id. 1964; Strobel 1978: 135; Declercq 2002: 170.

19 McCarthy and Breen 2003: 84, 132.

must have followed Ptolemy in this matter, too, and counted the days of Aries from the equinox on 26 Phamenoth. The fourth day of Aries would therefore be not the 26th day of Phamenoth, equivalent to 22 March, but the 25th day of March. Such indeed is the reading of the Latin Anatolius.

McCarthy concludes that the passage makes sense only with the reading of the Latin version. According to Anatolius, the sun entered Aries on 26 Phamenoth, equivalent to 22 Dystros and 22 March, and was in the fourth day on 25 March, the traditional date of the equinox in the Roman calendar. Anatolius was trying to harmonize the different traditions. He defined the equinox not on a fixed date, but as occurring within the first segment of Aries. The 19-year Paschal table included with the Latin version is consistent with this interpretation, according to McCarthy, and represents the authentic table of Anatolius. It begins with a new moon with epact 1 on 1 January, epact 25 on 25 March, and Easter Sunday on 16 April, the 18th day of the moon. The date of the fourteenth moon is not expressed, but would be 12 April. The reference in the beginning of the passage to the first year of the 19-year cycle with a new moon on 26 Phamenoth = 22 March is not, in McCarthy's view, a reference to the 19-year Paschal cycle of the author, but to the beginning of the Jewish 19-year lunar calendar.[20]

Many objections can be raised against this set of hypotheses. First, the idea that Eusebius deliberately falsified the text of Anatolius is far less plausible than that the author of the Latin treatise did so. If Eusebius did publish a 19-year cycle of his own, it presumably looked much like the later Alexandrian cycle that we know through Dionysius Exiguus. Even if it was idiosyncratic, it is difficult to see what motive Eusebius would have had for distorting his predecessor's work by changing 25 March to 22 March. It is far more likely that the author of the Latin text changed 22 March to 25 March, for such a change would suit the purpose of defending the British calculations against the Alexandrian methods of Victorius and Dionysius.

In order to defend his claim that the Latin presents a better text than does Eusebius, McCarthy must explain why the last section of Eusebius' quotation does not appear in the Latin text. This is the section numbered 7. 32. 19 in the text of Eusebius, beginning with 'I know that many other things have been said by them.' McCarthy argues that this is a comment on the part of Eusebius. Yet the 'by them' is clearly a reference to additional Jewish precedents besides those that Anatolius has cited. Anatolius says that many of these Jewish precedents fall just short of absolute proof (that the Pasch should follow the equinox), but that he will not demand such absolute proof from those from whom the veil of the Law has been removed. The meaning here is obscure, and every translator has rendered the passage differently. It makes more sense as a concluding remark on

[20] McCarthy and Breen 2003: 79, 84–5, 98–102.

the part of Anatolius, than as a comment by Eusebius. The author of the Latin text simply chose to pass over it.

More serious objections arise from evidence that McCarthy fails to cite. He claims that there is no precedent for making 22 March the fourth day of Aries. The statement is true, narrowly construed, but it is not the whole truth. Vitruvius, Columella, and Pliny the Elder—Roman writers of the period from about 40 BC to AD 70—all state that the vernal equinox occurs when the sun is in the eighth part of Aries.[21] Columella and Pliny designate the calendar date as the eighth day before the Kalends of April, 25 March.

The definition of the equinox at the eighth degree of Aries derives from the Babylonians (Neugebauer 1975: 368). It was no longer astronomically correct in the first century AD. The Roman calendrical convention that defined the equinoctial and solstitial points as of the eighth day before the Kalends of the relevant months is of unknown origin. The combination of the now antiquated Babylonian norm with the Roman date on 25 March results in a date of 18 March for the first point of Aries.

Bede (*DTR* 6; cf. *DTR* 16) states explicitly that the sun enters into the sign of Aries on 18 March and that the equinox occurs on 21 March, the fourth degree of Aries. Thus it is true to say that there is no precedent for equating 22 March with the fourth day of Aries. There is ample precedent, however, for associating the equinox with a position in Aries other than the first day and for locating the entrance of the sun into Aries at a date other than 22 March.

Eduard Schwartz (1905: 15) suggested that Anatolius followed a convention in the Alexandrian calendar according to which the sun enters Aries on 23 Phamenoth = 19 March and reaches the equinoctial point on the fourth day, 22 March. More likely, Anatolius knew and accepted the convention that made the first day of Aries equivalent to 22 Phamenoth = 18 March. In that case, either Anatolius simply subtracted 18 from 22 to find that 22 Phamenoth represents the fourth degree of Aries or he meant that on 26 Phamenoth = 22 March the sun has not only entered the first sign, but 'already' passed the fourth day within it.

v. The First Year of the 19-Year Cycle

The 19-year cycle included in the Latin text begins with epact 1 on 1 January, epact 25 on 25 March, and a 14th day of the Paschal moon on 12 April. This cycle is a curious structure, allowing only two leap days in nineteen years, instead of four or five. This structure permits the cycle to return to its start

[21] Vitruvius 9. 3. 1; Columella 1. 14; Pliny, *Nat. Hist.* 2. 81, 18. 246; see Neugebauer 1975: 594–97.

with the same weekday with which it began. For van der Hagen and Krusch, this anomalous structure was evidence in itself of falsification. McCarthy argues that the cycle is based on principles found in the Book of Enoch and alluded to in the Latin text. For McCarthy, the impossibility of such a cycle only shows that Anatolius was not particularly well schooled in matters astronomical and calendrical.

McCarthy fails to acknowledge the evidence—well known to students of the subject—that the cycle of Anatolius did begin, as Eusebius' quotation states, with a new moon on 26 Phamenoth = 22 March. Anatolius does not say whether the new moon in the first year of his cycle has epact 30 = 0 or epact 1. A new moon with epact 0 as of 22 March implies a 14th day of the moon on 5 April. That datum appears in the later Alexandrian cycle, as we have it from Dionysius Exiguus, at the first year. The epact 1 entails a 14th day of the moon on 4 April, corresponding to the 12th year of the classical cycle. Several pieces of evidence suggest that the Paschal full moon of 4 April was originally at the head of the cycle of Anatolius.

Within the period that Anatolius is likely to have been at work, the twelfth year of the later cycle corresponds cyclically to AD 257/8 and 276/7. In his *Chronicle* (p. 223 Helm), Eusebius dates the fame of Anatolius to the 270s and specifically to the second year of Probus. Eusebius has the dates of the Roman emperors a year or two too late in this portion of the chronological canons, and the second year of Probus corresponds to 279/80. Probus became sole emperor in the summer of 276.[22] The Astronomical Canon (Mommsen 1898: 449), however, lists him immediately after Aurelian (omitting Tacitus and Florian) at the year corresponding to AD 275/6. His second year was therefore 276/7. Earlier scholars concluded that Anatolius had constructed his table with that year as his base date and a new moon on 22 March 277.[23]

Additional evidence that the Alexandrian tables originally began with a Paschal full moon on 4 April in the year corresponding either to 257/8 or 276/7 comes from the combination of a note in the Paschal tables of Victorius of Aquitania with the Armenian Paschal tradition. In one of the manuscripts of Victorius' 532-year list, there is a note at the year corresponding to AD 353 (Krusch 1938: 42) that the Paschal cycle 'of the Greeks and the Macedonians' begins at this date 'after 95 years'. The year 353 corresponds cyclically to 258 and 277, with a 14th day of he moon on 4 April. Theodor Mommsen concluded (1892: 671) that this note refers to the beginning of the fifth and last of five 19-year cycles composed by Anatolius from a base-date in the year corresponding to

22 *Historia Augusta*, Probus 10.1, with David Magie's note (iii. 354) referring to Alexandrian coins of Probus minted before 1 Thoth of 276.

23 Van der Hagen 1736a: 142; Ideler 1825–6: ii. 228.

AD 277. Schwartz agreed that Victorius' note must be a reference to the Anatolian cycle, but suggested (1905: 15–18) that the 95-year table of Anatolius ended in 352 and therefore had 258 as its base date. A few years later, Schwartz (1909: ccxlvi) retracted that opinion. Friedrich Ginzel (1906–14: iii. 233) therefore endorsed the earlier view that the table of Anatolius began in 277.

The year 353 as the beginning of a Paschal table with 4 April at its head follows also from the Armenian evidence. Samuel of Ani (*PG* 19. 683) is one of several Armenian authors who state that in the year corresponding to AD 552, the 200-year Paschal table of Andreas ended. That list, Samuel says, began with a full moon on 4 April. It seems therefore that it was the table of Andreas beginning in 353 to which the note in Victorius' list refers and that, as the note suggests, Andreas' table was a continuation of a 95-year table that began in 258.

One more piece of evidence for a cycle beginning with 4 April comes from a 95-year list of dates for Easter first published by André van de Vyver in 1957 (see below). It begins with Easter Sunday on 7 April, the 17th day of the moon, in the year corresponding to AD 429. The 14th day of the moon was therefore on 4 April. The preface indicates that the list was a continuation of a table that began 95 years earlier in 334. The likeliest reason for a table beginning with 4 April in the year corresponding to AD 334 is that it was a continuation of the cycle of Anatolius, beginning in the last 19-year cycle of the 95-year table that began in AD 258.

Venance Grumel was unaware of van de Vyver's discovery when he completed his book on Byzantine chronology. In a thorough re-examination of the other evidence, he argued (Grumel 1958: 49–53) that Anatolius gave his new 19-year cycle an effective date in the year 277, the second year of Probus, but that he began the 95-year list 19 years earlier, in 258. He suggested that Eusebius found both the second year of Probus and the synchronisms that he associates with it in the work of Anatolius. Grumel's view is now widely accepted and rightly so—Anatolius composed a 95-year cycle beginning with a 14th day of the moon on 4 April 258 and ending in 352.[24]

3. THE 19-YEAR CYCLE ATTRIBUTED TO EUSEBIUS

St Jerome included the name of Eusebius of Caesarea among those responsible for the development of the 19-year cycle. Jerome says (*de viris illustribus* 61) that Hippolytus 'discovered the cycle of sixteen years, which the Greeks call the *hekkaidekaeteris*, and thus set a precedent for Eusebius, who composed for the

[24] Declercq 2002: 170; Wallis 1999, xlvii.

Pascha a cycle of nineteen years, the *enneadekaeteris*'. Jerome mentions no such Easter table in his notice on Eusebius (ibid. 81). Gennadius of Marseilles, in his additions to Jerome's work, says of Victorius of Aquitania (*de viris illustribus* 88) that he 'composed a Paschal cycle after a careful investigation and following his four predecessors Hippolytus, Eusebius, Theophilus, and Prosper'. St Bede, in his introduction to the 19-year cycle, explicitly states that Eusebius was its inventor: 'Eusebius, bishop of Caesarea in Palestine, first devised the sequence of the 19-year cycle in order to find the fourteenth moons of the Paschal feast and the day of Easter itself.'[25] In his *History of the English Church and People* (5. 21), Bede also preserves a letter on the history of Easter from Bishop Ceolfrid to the King of the Picts, in which Ceolfrid says that Eusebius devised a system for calculating the date of Easter. Jones (1943: 24–6) cited some manuscripts of the Carolingian period that include 19-year cycles attributed to Eusebius. In addition, as Daniel McCarthy (2003: 138) has pointed out, there is an entry in the *Annals of Tigernach* at a year corresponding to AD 309 that Eusebius of Caesarea composed a 19-year cycle.

No such Paschal cycle is extant among the works of Eusebius, nor does Eusebius anywhere say that he composed a list of Paschal dates. Eusebius does in his *Life of Constantine* (4. 34–5) refer to an essay 'On the Festival of the Pascha' that he dedicated to the emperor, and he quotes Constantine's letter of acknowledgement. Eusebius characterizes the work as a theological essay in which he reveals the 'mysteries' of the feast. In his acknowledgment, Constantine thanks Eusebius for his useful discussion of the mysteries of Christ, the origin of the feast and the debate about it.

Angelo Mai discovered a substantial fragment of this work in 1847.[26] In this text, Eusebius argues that Christians celebrate the Pascha not only in the season of the 14th day of the first month, but also every week on the Lord's day. He mentions the presence of the emperor at a synod at which the Pascha was discussed—clearly a reference to the council of Nicaea. He says that the eastern bishops finally agreed to abandon their ancient custom and to observe the Paschal festival at the same time as the rest of the Christian world. There is no reference to any method of calculating the date of the 14th of Nisan.

The only other references to this work 'On the Pascha' come from Elias of Nisibis (Eliyah Bar Shinaya). Elias was bishop of the northern Mesopotamian city of Nisibis (Nusaybin in south-east Turkey). He wrote a chronographic work ending in the year 409 of the Islamic era (AD 1018/19). Elias cites the *de Paschate* of Eusebius for the statement that Jesus rose from the dead at the vernal equinox on 24 March. Elsewhere, Elias quotes more extensively from

[25] Bede, *DTR* 44; translation by Wallis 1999: 121.
[26] Reprinted *PG* 24. 693–705.

what he calls the *de azymis* ('On the unleavened bread') of Eusebius for the same information.[27]

That Eusebius in revealing the mysteries of the Paschal feast might have made a typological association between the Resurrection and the vernal equinox is not implausible. Given his references to the rule of the equinox in the *Ecclesiastical History*, however, it is unlikely that Eusebius would have made the Sunday of the Resurrection coincide with the equinox. Furthermore, 24 March was a Sunday during the appropriate period only in AD 26 and again in AD 37, and neither date fits any known chronology for the life of Jesus. In his *Chronicle*, Eusebius dated the Passion to the 18th year of the emperor Tiberius, AD 32 or 33.[28] There is no parallel for the use of 24 March as a date for the equinox. In Greek, the symbols for 1 and 4 are easily confused. It is possible that Elias had a defective copy of the *de paschate* in which a copyist had misread 21 as 24. In that case, Eusebius used the standard date of 21 March for the equinox and noted the approximate synchronism between that date and the Resurrection.

Franz Rühl (1897: 115) thought that Eusebius might have been involved in the reform of the Anatolian cycle that he believed took place during the reign of Diocletian. As we shall see, no such reform need be supposed to have occurred. Jones (1943: 24) suggested that perhaps Eusebius had included a Paschal table in the first book of his *Chronicle*. McCarthy believes that a now lost *Chronicle* of Rufinus of Aquileia was the ultimate source for both Jerome and the author of the *Annals*. He suggests (2003: 46–7) that Rufinus had this information from a copy of the *Chronicle* of Eusebius independent both of Jerome's version and the extant Armenian translation. McCarthy (2008) has pursued the idea of a lost chronicle of Rufinus further in an article on Bede's chronological sources.

The Armenian text of the first book of the *Chronicle* of Eusebius ends with the statement that the author will append a list of the Roman emperors and a list of the Roman consuls, with notation of the corresponding Olympiad years (p. 143 Karst). Similarly, in the preface, where Eusebius epitomizes the contents of the book, he says that the collection of material ends with a list of Roman kings, emperors, and consuls (p. 3 Karst). There is no hint of a list of Paschal dates, nor would such a list have been relevant to Eusebius' purposes as a chronicler. Josef Karst, in the introduction to his 1911 German edition of the Armenian text, argued (pp. xxx–xxxiii) that Eusebius never realized his intention of including even the lists of emperors and consuls.

The attribution of a 19-year Paschal cycle to Eusebius is an error. The source of the error is likely to have been the association of Eusebius both with

[27] Elias Nisibenus, pp. 73, 118 in Chabot's translation.
[28] See p. 174 Helm; the Armenian version (p. 213 Karst) reads 19th; see Ch. 14.

chronography and with the Council of Nicaea. The Persian chronologist Al-Biruni attributes the Christian method for calculation of the Passover to 'Eusebius, bishop of Caesarea, and the 318 bishops of the synod of Nicaea' (ch. 16, p. 302 Sachau). The role of Eusebius at the Council of Nicaea led to the association of his name with the 19-year cycle that came falsely to be attributed to that council.

4. THE STRUCTURE OF THE CYCLE OF ANATOLIUS

Whatever the origin of the Latin text claiming to be the work of Anatolius, we must accept the testimony of Eusebius that the 19-year cycle of Anatolius began with a new moon on 26 Phamenoth = 22 March and the other evidence that it had the 14th day of the moon on 9 Pharmouthi = 4 April. That one datum is, unfortunately, not enough in itself for reconstruction of the table. We also need to know what was the earliest date in the month of Phamenoth at which Anatolius allowed the Paschal full moon to occur and at what position in the cycle he placed the *saltus*, the 'leap of the moon', where the epact advances by 12 instead of 11.

i. The Reconstruction of Schwartz

The standard reconstruction is that of Schwartz (1905: 15–17). Schwartz read the passage quoted by Eusebius to mean that Anatolius dated the equinox to 22 March and made that date the earliest permissible 14th day of the Paschal moon. He also assumed that Anatolius, like his Alexandrian successors, placed the *saltus* at the end of the cycle, so that the epact moved from 19 in the last year to 1 in the first year of the next iteration. His reconstruction, which Grumel and most other scholars accept, is as shown in Table 4, with the classical Alexandrian cycle that we know from Dionysius included for comparison. Without explanation Schwartz shows the cycle as beginning with epact 11, instead of 1. Grumel (1958: 54) follows him, again without explanation. Epact 11, with a 14th day of the moon on 4 April, implies 1 April as the seat of the epact. There is no parallel for the epact defined in that way. Schwartz's list of epacts is an error. Table 4 therefore begins with epact 1.

On Schwartz's reconstruction, the Anatolian dates for the 14th day of the moon agree with those of the later Alexandrian cycle for the first eight years, but differ beginning in what was the 9th year of the cycle for Anatolius, the first year in the later cycle. This difference derives from Schwartz's assumption

Table 4. The 19-year cycle of Anatolius as reconstructed by Schwartz, compared with the classical cycle

	Cycle		Epact		Moon 14	
AD	Anat.	Class.	Anat.	Class.	Anat.	Class.
258	1	12	1	1	4 Apr	4 Apr
259	2	13	12	12	24 Mar	24 Mar
260	3	14	23	23	12 Apr	12 Apr
261	4	15	4	4	1 Apr	1 Apr
262	5	16	15	15	20 Apr	21 Mar
263	6	17	26	26	9 Apr	9 Apr
264	7	18	7	7	29 Mar	29 Mar
265	8	19	18	18	17 Apr	17 Apr
266	9	1	29	30	6 Apr	5 Apr
267	10	2	10	11	26 Mar	25 Mar
268	11	3	21	22	14 Apr	13 Apr
269	12	4	2	3	3 Apr	2 Apr
270	13	5	13	14	23 Mar	22 Mar
271	14	6	24	25	11 Apr	10 Apr
272	15	7	5	6	31 Mar	30 Mar
273	16	8	16	17	19 Apr	18 Apr
274	17	9	27	28	8 Apr	7 Apr
275	18	10	8	9	28 Mar	27 Mar
276	19	11	19	20	16 Apr	15 Apr

that in both cycles the *saltus* appeared at the end. Whether this difference would affect the date of Easter depends on the weekday on which the 14th day of the moon falls.

There is also a difference in the date of the Paschal full moon in the 5th year of the cycle, where the Anatolian cycle has 20 April, according to Schwartz, the later cycle 21 March. The reason for this difference is the assumption that Anatolius dated the equinox to 22 March and therefore could not allow a 14th day of the moon on 21 March.

If Schwartz's reconstruction is correct, there must have been a reform of the Alexandrian cycle at some time between 277, when Anatolius presumably published his cycle, and 437, the first year of the Cyrillan cycle that Dionysius used as his exemplar. That reform must have taken place by the time of Athanasius. In his Paschal letter for the year corresponding to AD 338, the 5th year of an Anatolian cycle, Athanasius prescribes Easter for Sunday the 30th day of Phamenoth, 26 March in the Roman calendar (see Ch. 9). In that year of the Anatolian cycle, as Schwartz reconstructed it, the 14th day of the moon falls on 20 April. With a date for Easter on 26 March, Athanasius must have accepted the previous 14th day of the moon, on 21 March, as the date of the Paschal full moon in that year. It follows therefore that by the time of Athanasius the Alexandrians recognized 21 March as the date of the equinox and the earliest permissible date for the 14th day of the moon.

ii. The Theory of a Fourth-Century Reform

From the assumption that Anatolius dated the equinox to 22 March and the fact that Athanasius apparently recognized the equinox as falling on 21 March, scholars have built an elaborate theory about a reform of the 19-year cycle of Anatolius sometime during the first quarter of the fourth century.

The scholarly consensus holds that this reform of the Paschal table was not simply an adjustment of the date of the Paschal moon in the one year of the cycle of Anatolius when a change in the date of the equinox from 22 March to 21 March would make a difference. The reform also involved recalibrating the 19-year cycle such that its first year no longer had a base date corresponding to the Alexandrian year 257/8, but rather now corresponded to 284/5, the first year of Diocletian.

A cycle with a base-date in the first year of Diocletian and epact of $30 = 0$ on 26 Phamenoth produces a calculated new moon with epact 1 on 1 Thoth, the first day of the Alexandrian civil year (Ginzel 1906–14: iii. 135). Therefore, according to the standard scholarly theory, the reform consisted partly of a change in the equinoctial date, partly the adjustment of the cycle as a whole from a lunar new year beginning at the vernal equinox to a lunar new year beginning on 1 Thoth in the first year of Diocletian.

Ludwig Ideler (1825–6: ii. 232) suggested that the only logical explanation for why the Christians of Alexandria should have chosen to incorporate the name of the Great Persecutor Diocletian in their tables is that it must have been inaugurated during that emperor's reign. That the supposed reform of the Alexandrian cycle took place during or shortly after the reign of Diocletian is now also part of the standard view.

The discovery in the 1840s of a Syriac version of the Paschal letters of Athanasius, with dates for Easter Sunday largely in agreement with what the later Alexandrian cycle would produce for that period, seemed to confirm the idea that the Alexandrian cycle had already taken its classical form by the time of Athanasius. Schwartz (1905: 18) argued that the Anatolian cycle must have been reformed so as to move the Paschal limit from 22 March to 21 March at some time between 320 and 338. Schwartz believed that the Paschal moon reckoned as of 21 March in Athanasius' letter for the year 338 was the first such notice of the new date for the equinox.

Grumel (1958: 36) attributed the reform of the Anatolian cycle to Peter, who was bishop of Alexandria from about 300 to 311. The *Chronicon Paschale* (4–12) preserves a text attributed to Peter, in which he argues that the 14th day of the Passover moon cannot fall before the equinox and that the Jews of antiquity observed this law. Grumel therefore concluded that it was Peter, or someone working at his direction, who moved the date of the equinox from 22 March to 21 March and recalibrated the cycle to make its first year coincide with the first year of Diocletian and the new moon of 1 Thoth. Grumel also believed that it was a decision on the part of Alexandrian astronomers to recalculate the equinox that led to this reform.

Marcel Richard (1974) argued that the reform must have taken place after 309, perhaps in 322/3, when the new moon could have been observed in Alexandria on the first day of Thoth. Richard's argument is based on his discovery of a Paschal letter attributed to Peter of Alexandria prescribing 10 April as the date for Easter Sunday. Within the patriarchate of Peter, that year can have been only AD 309. In the later Alexandrian table, 10 April counts as the 14th day of the moon, so that in 309 the observance should have been postponed until 17 April. Richard believed that this reform replaced the old octaëteris. As I suggested in Ch. 7, it is more likely that Peter used the Anatolian 19-year cycle, but for one reason or another allowed Easter Sunday to coincide with the 14th day of the moon in the year 309.

André van de Vyver (1957) took a different approach and concluded that there were at least two instances of reform. He based his argument on a 95-year table of Easter dates that he found in a seventh-century Paris manuscript (BNF lat. 10318). The table is in Latin and expresses dates only in the Roman calendar. It covers five 19-year cycles numbered by the years of Diocletian from 145 to 239, corresponding to AD 429 to 523. The heading attributes the table to Dionysius of Alexandria. Eusebius (*HE* 7. 20) says that Dionysius advocated an 8-year cycle. Nevertheless, it was during the patriarchate of Dionysius (249–65) or shortly thereafter that Anatolius constructed his 19-year cycle. Hence, van de Vyver suggests, the name of Dionysius came to be associated with the cycle of Anatolius. He designates this 95-year list as *P.*

The year 429 corresponds cyclically to AD 258. The list therefore has the same base-date as the Paschal table of Anatolius. The table covers the years 145 to 239 of Diocletian, but the prologue refers to a table that began in the 50th year of Diocletian. The list gives only the dates for Easter Sunday and the age of the moon as of that date. From this information one can easily infer the lunar epact for the year and the date of the Paschal full moon. The data agree not with the cycle of Anatolius as Schwartz reconstructed it, but with the classical Alexandrian table at every year but one. In the 9th year of each cycle, corresponding to the first year of the classical cycle, *P* has the 14th day of the Paschal moon on 6 April, where the classical cycle has 5 April. This means that the epact for the year—the age of the moon as of 22 March—is $30 = 0$ in the classical table, 29 in *P*. For the following year, *P* has a 14th moon on 25 March, in agreement with the classical cycle. Thus the epact moves from 29 in *P*'s ninth year to 11 in the tenth year.

Van de Vyver argued that this document represents the cycle of Anatolius with its 'leap of the moon' in the middle of the cycle, between its 9th and 10th year, rather than at the end of the cycle, in the 19th year, as in Schwartz's reconstruction. He suggested that a *saltus* in the middle of the cycle, at the tenth year, has the advantage of distributing the required one-day differential more evenly throughout the cycle than is the case with a *saltus* placed at the end.

Van de Vyver concluded that the cycle preserved by *P* represents an intermediate step between the cycle of Anatolius and the later classical form of the Alexandrian cycle. He followed Rühl in believing that Anatolius dated the equinox to 19 March. At the initial stage of reform represented by *P*, van de Vyver argued, the equinox was changed to 21 March, but the cycle of Anatolius was retained, with a base-date corresponding to 258 and the *saltus* in the middle of the cycle. At the next and final stage in its development, the Alexandrian cycle was revised again such that its first year began in what had been the 9th year of the Anatolian cycle, the *saltus* was moved to what was now the 19th year, and the first year of the cycle obtained a base-date corresponding to the first year of Diocletian. Thus, van de Vyver says (1957: 12), 'the Alexandrian era of Diocletian was created and the Christian computus, which had previously been strictly Paschal, now applied to the entire year'.

The problem with all these theories is that there is no direct evidence to support the hypothesis of a change in the date of the equinox between the time of Anatolius and that of Athanasius. Grumel (1958: 36) concedes that point, but states that it is 'absolutely necessary' to posit such a change in order to explain not only the Athanasian dates for Easter but also the recalibration of the cycle such that it began not with the new moon of the equinox, but with the new moon of the Alexandrian civil calendar.

The hypothesis is necessary only if one insists that Anatolius must have dated the equinox to 22 March and that the Paschal letters of Athanasius imply the use of a 19-year cycle identical with the later Alexandrian cycle as we know it from Dionysius Exiguus. I shall deal first with the question of the equinox and examine the evidence of Athanasius in a separate chapter.

iii. The Date of the Equinox

The 'equinox' is the point in the sun's apparent motion between northern and southern extremes at which the length of the night is equal to the length of the day. The corresponding Greek word means 'equal day', rather than 'equal night'. Astronomically, the equinox is defined as the point where the centre of the sun crosses the plane of the earth's equator in either direction. There is thus both a vernal equinox and an autumnal equinox. The northerly and southerly extremes are the summer and winter solstices, so called because the sun appears to 'stand' at those points for several days.

The 'mean tropical year' is the average of the time elapsed from one year to the next between each of the four equinoctial and solstitial points. The commonly accepted value of 365.24219 days is that calculated by Simon Newcomb in 1895, with various more recent proposals for modification.[29] Because the Julian year is defined as 365.25 days, the equinox arrives about .00781 days earlier each year with respect to the Julian calendar. This differential accumulates to one day in about 130 years. There is also an approximately six-hour variation in the calendar date and time of the equinox from one year to the next corresponding to the leap-year cycle. Thus, in 2004 the vernal equinox occurs on 20 March at 06.49 GMT, in 2005 at 12.33, in 2006 at 18.26, in 2007 the date becomes 21 March at 00.07, and in 2008 the insertion of a leap-day causes the date of the equinox to return to 20 March, now at 05.48.[30]

This creep with respect to the calendar is a different phenomenon from that known as the 'precession of the equinoxes'. This term refers to the circular motion of the Earth's rotational axis with respect to the fixed stars. Hipparchus of Rhodes first described the phenomenon, about 150 BC.[31] The modern value is 50.290966 arc-seconds or 0.0139697 degree per year, yielding a total period of approximately 25,770 years.[32]

Because of this precession, the equinoctial point appears to move with respect to the twelve divisions of the Zodiac. The motion accumulates to one degree in approximately 71.58 years. The equinoctial point is presently within the constellation of Pisces. At some time in the past, it was observationally correct to say that the equinox was in the eighth part of Aries. Columella (9. 14. 13) says that he follows Meton and Eudoxus in dating the equinox and solstices to the eighth degree of the appropriate constellation. As Otto Neugebauer has shown, this definition of the equinox derives from the Babylonians—not from Meton or Eudoxus.[33]

29 Newcomb 1895; Borkowski 1991.
30 http://aa.usno.navy.mil/data/docs/EarthSeasons.php, accessed 29 Feb. 2008.
31 Ptolemy, *Almagest* 7. 2; Neugebauer 1950; id. 1975: 292–8.
32 Lieske et al. 1977: 15.
33 Neugebauer 1950: 2; 1957: 188; 1975: 594–8.

Anatolius began his cycle with the new moon of 26 Phamenoth. According to the text preserved by Eusebius, he defended his choice by pointing out that the sun is well within the constellation of Aries on that date and is traversing or has already passed the fourth part. Anatolius defines Aries as the sign of the equinox. He goes on to cite Jewish authorities to the effect that the sun must be rising within the constellation of Aries at the time of the Passover and that the Paschal offerings can be made only after the equinox.

Isaac Newton (1728: 94) pointed out that if the equinox was in the eighth part of Aries in the fifth century BC, then it would have been in the fourth part of Aries in the time of Hipparchus about 150 BC. It is possible that Hipparchus knew of the Babylonian convention associating the equinox with the 8th point of Aries and stated that it had moved into the fourth part by his time. Unfortunately, his book on the phenomenon of precession is not extant. According to Columella, Hipparchus preferred to redefine the first point of Aries at the equinox.

Anatolius might have known of a definition of the equinox as being in the fourth part of Aries. Or he might have known the convention associating a date corresponding to 18 March with the first part of Aries, from which it followed that 26 Phamenoth = 22 March was either the fourth or the fifth day, depending on how one counted. From the passage as a whole, it seems likely that Anatolius recognized 26 Phamenoth = 22 March as marking either the equinoctial point or the first day thereafter. The text cannot in itself be made to yield a date for the equinox.

Claudius Ptolemy (*Almagest* 3. 1) reported an observation of the equinox at a date corresponding in the Julian calendar to 22 March AD 140. By modern astronomical calculations, the equinox occurred in Ptolemy's time on 22 March in ordinary years, 21 March in leap years. In the time of Anatolius 120 years later, the equinox was on 21 March in ordinary years, 20 March in leap years. March 21st in the Julian calendar is correct as the average date of the equinox only in the third century. In the time of Athanasius, in AD 340, the equinox was occurring, on average, at the Julian date of 20 March.[34]

By the middle of the fourth century, the recognized date of the equinox for the purpose of Paschal calculations was 21 March. The earliest explicit references to that date come from the 380s. In the prologue to his Paschal list, composed between 385 and 395, Theophilus of Alexandria admonishes the reader to mark carefully the date of the equinox, which is the twelfth day before the Kalends of April (21 March) in the Roman calendar, 25 Phamenoth in the Egyptian calendar (Krusch 1880: 223). In his letter on the proper date

[34] Equinox calculator downloaded from http://www.hermetic.ch/cal_sw/ve/ve.htm, 8 Aug. 2007.

for Easter in the year 387 (*Extra Collectionem* 13. 16), Ambrose of Milan says that the equinox falls on the twelfth day before the Kalends of April, according to those who are skilled in such matters. The date 21 March is also implicit in the Paschal letter of Athanasius for the year 338.

Schwartz, Grumel, and other modern scholars believe that the recession in the Julian date of the equinox between the time of Ptolemy and that of Athanasius, from 22 March to 21 March, prompted a reform of the Paschal calculations. Such a scenario is improbable for several reasons.

We must first suppose that the Alexandrian astronomers with whom Anatolius could have consulted in the 260s were not astute enough to have noticed that the mean date of the equinox was now 21 March, not 22 March as in the time of Ptolemy. By the time of Athanasius, however, we must suppose that the astronomers were astute enough to have taken note of the slippage in the date, but not sufficiently astute to have reckoned the date correctly as 20 March. Finally, we must suppose that the bishop of Alexandria was concerned enough about the problem to request a revision of the Anatolian cycle. Calendrical conventions, even of relatively recent origin, are resistant to change. Dionysius Exiguus and Bede accepted the Alexandrian date of 21 March for the equinox, although the true equinox had slipped back to 18 March by AD 525 and to 17 March by 725. The bishops of Rome allowed the differential to accumulate to ten days before deciding to rectify the problem in the sixteenth century.

The best explanation for the acceptance of 21 March as the date of the equinox in the Alexandrian calculations of the fourth century is that the date was already conventional in the time of Anatolius. The hypothesis gains credence from the fact that only in the time of Anatolius was 21 March in fact correct as a date for the equinox.

It is one sort of thing to observe the equinox on a specific date, something entirely different to establish a calendrical convention for the equinoctial points. The Roman calendar defined the equinoxes and the solstices as falling the eighth day before the Kalends of the appropriate month. Thus the vernal equinox was VIII Kal. Apr., 25 March, the summer solstice was VIII Kal. Jul., 24 June, the autumnal equinox was VIII Kal. Oct., 24 September, and the winter solstice occurred on VIII Kal. Jan., 25 December.

Thanks to Otto Neugebauer's study of the Ethiopic computus (1979*a*: 204–5), we now know that the Alexandrian calendar, from which the Ethiopic derives, defined these solar points in a similar fashion—by reference to a fixed calendar day of the appropriate month, namely the 25th. The autumnal equinox was defined as 25 Thoth = 22 September, the winter solstice as 25 Choiak = 21 December, the spring equinox as 25 Phamenoth = 21 March, and the summer solstice as 25 Payni = 19 June. The seasons are said to begin on the next day. Thus spring begins on 22 March, and autumn on 23 September. The Ethiopic texts are late evidence, but there is no reason to deny that this convention could have originated in the third century at a time when the vernal date, at least, would have been correct.

It is true, as Grumel points out, that Elias of Nisibis explicitly states that Anatolius dated the equinox to the 22nd day of the month of Adar (March).[35] The statement appears in a series of historical observations of the equinox, with receding dates, from which Elias rightly concludes that the solar year must be somewhat less than 365¼ days. The date he attributes to Anatolius is probably no more than an inference from the text of Eusebius.[36] That inference need not have been any more correct in the eleventh century than it is in the twenty-first. Bede (*DTR* 6) cites the same text to support his argument that the equinox occurs on 21 March.

There is also a passage in the *Apostolic Constitutions* in which the date of 22 Dystros is associated with the equinox. This text in eight books is a late-fourth-century compilation, probably of Syrian origin, of various ordinances relating to ecclesiastical order. In book five, the author instructs Christians to observe the days of Pascha only after the vernal equinox, which he states occurs on the 22nd day of the last month in the Hebrew year, namely the month of Dystros. In book eight, the author calls for the deposition of any bishop, presbyter, or deacon who observes the Pascha with the Jews before the vernal equinox.[37] The two statements are not entirely consistent with one another. The author's intent is to set 22 March as the earliest possible date for Easter Sunday. That date is consistent with the Paschal calculations of Alexandria and, presumably, of Anatolius. The author wrongly interpreted 22 March as being the equinoctial point.

If Anatolius recognized 25 Phamenoth = 21 March as the equinoctial point, several considerations nevertheless combine to make 26 Phamenoth = 22 March an appropriate date for the first new moon in the 19-year cycle.

First, as explained in Chs. 5 and 6, a definition of the annual epact (e) as corresponding to the age of the moon on the last day of the previous year facilitates calculations in the Alexandrian civil calendar. One can calculate the date (P) of the Paschal full moon by the formula $P = 40 - e$. One can also calculate the age of the moon as of any date in the civil calendar through a formula that uses the number of the month and the number of the day. The 26th day of Phamenoth is 206 days, or almost exactly seven average lunations

[35] Elias Nisibenus, p. 73 in Chabot's translation; Grumel 1958: 31.

[36] So Chabot, ad loc.

[37] *Apostolic Constitutions* 5. 17, 8. 47. 7; on this document see the introduction to Metzger's edition.

of 29½ days each, after the last epagomenal day. As a Paschal calculator, Anatolius began his cycle with the new moon of 1 Nisan in the Hebrew calendar, rather than 1 Thoth in the Alexandrian calendar. He chose an Alexandrian date for 1 Nisan in the first year of the cycle that has the same calculated epact as the last epagomenal day. Therefore, if one knows the age of the moon on 26 Phamenoth in any year of the cycle, one can easily calculate both the date of the Paschal full moon and the age of the moon on Easter Sunday.

Second, 26 Phamenoth is the first day of spring in the Ethiopic/Alexandrian calendar (Neugebauer1979*a*: 204). It is therefore an appropriate date for the 'beginning of the months' in the Hebrew calendar. Third, the new moon of 26 Phamenoth has epact 1, the theoretical first visibility of the first crescent. The moon would be truly new at its conjunction with the sun, with epact 0, on 25 Phamenoth, the date of the equinox.

The rule that Anatolius asserts, citing Jewish authorities, is not that the offerings cannot be made *before* the equinox, but that the Passover sacrifices can be offered only *after* the equinox. The book of Leviticus (23. 5–6) ordains that the Passover is on the 14th day of the moon and that the feast of unleavened bread begins on the 15th day. Thus, according to Anatolius, the earliest date for the 14th day of the moon is the equinox, 25 Phamenoth. The 26th day of Phamenoth, beginning proleptically in the evening according to Jewish custom, was the earliest date for the Passover offerings. Anatolius was therefore the author both of 21 March as the equinoctial date for the purpose of Paschal calculations and of the Alexandrian rule prescribing the 15th day of the moon as the earliest date for Easter.

iv. The Position of the *Saltus*

There remains the question of the *saltus*. In order to reconstruct the 19-year cycle of Anatolius, we need to know not only the epact for the first year and the date of the equinox, but also where he put the 12-day leap of the moon. One can speak of the position of the *saltus* in three different ways. First, the 12-day advance in the epact results from the omission of one day in the lunar calendar. Therefore, one can ask which month of which lunar year has been made hollow (29 days) instead of full (30 days). Second, one can ask during which solar year of the cycle a lunar day has been omitted. Third, one can state at which solar year in the cycle the effect of the *saltus* becomes visible in the sense that the epact advances by 12 in relation to the previous year, instead of 11.

Arithmetically, it makes no difference where in the 19-year cycle the constructor places the *saltus*. Structurally and mnemonically, however, it does make a difference. Van de Vyver argued, on the evidence of his *P* document, that

Anatolius put the *saltus* between the epacts 29 and 11 at the end of the ninth year of the cycle, with the 12-day leap therefore appearing at the beginning of the tenth year.

The tenth year is not a convenient point either structurally or mnemonically. The best place for the *saltus*, from a mnemonic perspective, is at the end of the cycle. Then all one needs to remember is that the epact begins at either 0 (the later table) or 1 (Anatolius) and advances by 11 every year until it returns to 0 or 1 in the 20th year. That is the basis on which Schwartz reconstructed the Anatolian cycle.

Schwartz's assumption produces a series of epacts that disagree with the classical Alexandrian cycle in eleven out of nineteen years. The reform that he believes the cycle underwent in the 320s was therefore a more radical change than one would expect from the usually conservative ecclesiastical authorities of that or any other period. Van de Vyver's suggestion that Anatolius placed the *saltus* elsewhere than at the end is therefore attractive.

Structurally, a *saltus* between the 9th and 10th years, as in van de Vyver's *P* document, makes little sense. As Dionysius Exiguus explains in his letter to Boniface (Krusch 1938: 82), a 19-year cycle consists of an 8-year section and an 11-year section, corresponding to the allocation of the seven intercalary months between three months in one section and four in the other. In his discussion of the ogdoad and the hendecad, Bede (*DTR* 46) gives us another way of looking at it. Historically people thought that the octaëteris—an 8-year cycle—produced a lunisolar period. Later, Bede says, more learned doctors showed that the octaëteris is not cyclical unless one adds an 11-year period to it.

Anatolius is precisely the person who replaced an older 8-year cycle by adding an eleven-year cycle to it. In an 8-year cycle, the differential in the epacts accumulates to 88 days, two days short of a lunation, while an eleven-year cycle accumulates 121 days, one day in excess of a lunation. The one balances the other, leaving one day to be accounted for. A logical place to insert this extra day is at the junction between the ogdoad and the hendecad. By the rule of 11, the epact comes closest to returning to its start when a multiple of 11 approaches a multiple of 30. This happens in the ninth year after 8 intervals of 11 ($8 \times 11 = 88$), in the twelfth year after 11 intervals ($11 \times 11 = 121$), and in the twentieth year after 19 intervals ($19 \times 11 = 209$). The best places for the *saltus* are in the twelfth year and at the end, where the differential is 1.

Van de Vyver (1957: 12) suggested that the cycle of Anatolius consisted of a hendecad followed by an ogdoad. In that case, we would expect to find the *saltus*, if not at the end of the cycle, then at the end of the hendecad, with the 12-day differential appearing at the twelfth year. By inserting the interval of 12 in the twelfth year, one increases the excess days in the hendecad from 1 to 2 and thus cancels out the 2-day deficit in the ogdoad.

Structurally, a *saltus* in the twelfth year makes sense from another perspective as well. This 'leap' is an increase in the epact from one year to the next of 12 days, instead of 11. It results from the omission of one lunar day in the calendar. It makes no sense to omit a day from an ordinary lunar year consisting of six full months and six hollow months. The year in which the *saltus* occurs must therefore be embolismic, and the change consists in making one of the 13 months for that year hollow instead of full. If one looks at a 19-year cycle beginning with epact 1 and a 14th day of the moon on 4 April, and with 21 March as the earliest permissible date for the Paschal full moon, one will find that embolisms occur in years 3, 6, 8, 11, 14, 16, and 19. Thus, a *saltus* that makes its appearance in the twelfth year with a 12-day increase in the epact is caused by shortening one month of the embolismic eleventh year by one day.

The result would be a 19-year cycle that agrees with the later Alexandrian cycle in all but three of its years. In those years the different dates for the fourteenth day of the moon produce different dates for Easter only rarely in any given 95-year period. Therefore, when some time between Anatolius and Cyril the cycle was reformed, the changes resulted in little shock to the established tradition.

A *saltus* in the twelfth year of the Anatolian cycle will also explain two otherwise problematic elements in the later tradition. The twelfth year of the Anatolian cycle corresponds to the fourth year of the classical cycle, which Dionysius Exiguus numbers as the year 1 in the 'circle of the moon' (see Ch. 5). With the regular series of 11-day differentials starting at that point in the cycle of Anatolius, it was indeed the beginning of the cycle of epacts and Anatolius could with reason label it in a separate column as the 'circle of the moon'.

Second, the *saltus* in the twelfth year of the Anatolian cycle explains the origin of a formula for calculating the age of the moon that St Maximus the Confessor (*PG* 19. 1228 c–1229 b) attributes to certain computists whom he calls 'those who multiply by five and six'. Maximus says that these people distribute the *saltus* by dividing the day into 60 parts and adding 5/60 of a day to each year of the cycle, so that the fractions add up to one day in twelve years. The computists whom Maximus criticizes use the Byzantine cycle, which actually has its *saltus* in the 17th year (see Ch. 13). They must therefore have adapted their formula from a cycle that had the *saltus* in the twelfth year. It is a method for determining the true age of the moon as of any given date. Thus, if the first year of the cycle has epact 1 on the last epagomenal day, the true age of the moon on 26 Phamenoth in that year is $1 + 5/60$, $12 + 10/60$ in the second year, $23 + 15/60$ in the third year, and so on until in the twelfth year the moon is $2 + 60/60$ days old at the seat of the epact, at which point the number of the epact in the table is raised from 2 to 3. In the 19th year, the true epact will be 20 + 35/60. At that point, the fraction is dropped and the epact returns to 1 in the first year of the next cycle.

Arguing that Maximus was resident in Africa at the time that he wrote this tract, Schwartz thought that these 'multipliers' had adapted the method from the Roman 84-year cycle, which had a *saltus* at intervals of twelve years, with the 12-day leap therefore actually appearing in the 13th year.[38] It is true that the method makes better arithmetical sense if the epact begins with 1 and then proceeds to 12 + 5/60, 23 + 10/60, reaching 13 + 60/60 in the thirteenth year. Nevertheless, the use of such a formula among computists trying to make sense of the Byzantine cycle is better explained if it arose from within the Greek tradition.

A cycle beginning with epact 1 with a *saltus* in the twelfth year produces dates for the Paschal full moon in years 9, 10, and 11 on 6 April, 26 March, and 14 April, instead of 5 April, 25 March, and 13 April as in the classical cycle. Evidence that the cycle of Anatolius included those dates comes from the 30-year list of Paschal full moons generated by the eastern bishops for use at the Council of Sardica (see Ch. 9). The list begins in the year corresponding to AD 328 with a 14th day of the moon on 10 April. Since the compilers intended to produce a 30-year cycle, there is no *saltus* within the list. The epacts increase by 11 each year, accumulating to 330 in the 31st year, a number that requires no adjustment. The council met in 342 or 343. It is therefore reasonable to suppose that the list for the period from 328 to 343 was based on actual dates for the 14th day of the moon as calculated and observed in the eastern churches and specifically the churches of Syria. Closely related documents are extant in Syriac.[39] The cycle in use there must have been that of Anatolius. For the years from AD 328 to 344, the list agrees in every year with the dates that would be produced if the cycle of Anatolius had its *saltus* in the twelfth year. The dates for 342, 343, and 344 are 6 April, 26 March, and 14 April. The suppression of the *saltus* in the following year results in a 30-year cycle with dates different from those both of Anatolius and the classical cycle.

Van de Vyver was right that the 95-year table of *P* represents a form of the Alexandrian cycle intermediate between that of Anatolius and the classical cycle as we know it through Dionysius Exiguus. *P* is, however, less radically different from the cycle of Anatolius than van de Vyver supposed. It differs from the Anatolian cycle only in presenting a fourteenth day of the moon on 25 March and 13 April, instead of 26 March and 14 April. It differs from the

[38] Schwartz 1905: 83; cf. Grumel 1958: 120.

[39] Telfer 1943: 181–2, 193–8.

classical cycle only in producing a Paschal full moon on 6 April, instead of 5 April. Ch. 9 offers an explanation for these differences.

5. RECONSTRUCTION OF THE CYCLE OF ANATOLIUS

Table 5 shows the cycle of Anatolius reconstructed on the set of hypotheses for which I have argued. (1) The cycle begins with a new moon with epact = 1 on 26 Phamenoth = 22 March, producing a fourteenth day of the moon on 9 Pharmouthi = 4 April. (2) The earliest permissible date for the 14th day of the moon is 25 Phamenoth = 21 March, the vernal equinox. (3) The earliest permissible date for Easter Sunday is the 15th day of the moon, 26 Phamenoth = 22 March. (4) The cycle has its *saltus* at the end of the hendecad, appearing in the twelfth year where the epact moves from 21 to 3.

Table 5. The 19-year cycle of Anatolius as reconstructed in the present study, compared with the classical cycle

	Cycle		Epact		Moon 14	
AD	Anat.	Class.	Anat.	Class.	Anat.	Class.
258	1	12	1	1	4 Apr	4 Apr
259	2	13	12	12	24 Mar	24 Mar
260	3	14	23	23	12 Apr	12 Apr
261	4	15	4	4	1 Apr	1 Apr
262	5	16	15	15	21 Mar	21 Mar
263	6	17	26	26	9 Apr	9 Apr
264	7	18	7	7	29 Mar	29 Mar
265	8	19	18	18	17 Apr	17 Apr
266	9	1	29	30	6 Apr	5 Apr
267	10	2	10	11	26 Mar	25 Mar
268	11	3	21	22	14 Apr	13 Apr
269	12	4	3	3	2 Apr	2 Apr
270	13	5	14	14	22 Mar	22 Mar
271	14	6	25	25	10 Apr	10 Apr
272	15	7	6	6	30 Mar	30 Mar
273	16	8	17	17	18 Apr	18 Apr
274	17	9	28	28	7 Apr	7 Apr
275	18	10	9	9	27 Mar	27 Mar
276	19	11	20	20	15 Apr	15 Apr

9

Athanasius and the Council of Sardica

The fragment from a Paschal letter of Peter (Richard 1973: 267), announcing the date for Easter on Sunday, 10 April, the 15th day of Pharmouthi, is our earliest evidence for the date of Easter as actually observed in Alexandria. The year was probably AD 309 (see Ch. 7). The earliest continuous evidence comes from the time of Athanasius. According to the chronology of the Athanasian Index, Athanasius became bishop of Alexandria in 328, but spent a number of years elsewhere during several periods of exile before his death in 373. Like Peter, Dionysius, and others of his predecessors, Athanasius sent letters to inform his fellow bishops in Egypt of the date when Easter would be observed in Alexandria.

1. THE PASCHAL LETTERS OF ATHANASIUS

Until the middle of the nineteenth century, scholars knew of the Paschal letters of Athanasius only through a few fragments preserved by later authors. It is from a fragment of the letter for the year AD 367 that we have the list of the books of the Bible that Athanasius considered divinely inspired. This is the earliest list that is both comprehensive and in agreement with the list ultimately recognized as canonical. David Brakke (1995: 326–31) has published an English translation taking all known evidence into account.

None of the Greek fragments actually includes the portion of the letter in which Athanasius announced the date of Easter for the coming year. In 1842, William Cureton discovered several fragments of a Syriac collection of these letters among manuscripts recently acquired by the British Museum. Cureton published the Syriac text in 1848, under the title *The Festal Letters of Athanasius*. J. H. Parker published an English translation a few years later.

Coptic fragments of some of the letters have also since been found, published with French translation by Louis-Theophile Lefort in 1955. The best modern edition of the letters, taking account of all the evidence, is the annotated Italian translation of Alberto Camplani (2003).[1]

[1] For a summary of the status of the scholarship, see Barnes 1993: 183–91.

This collection of letters originally covered the entire period of the episcopate of Athanasius, from Easter of 329 to Easter of 373, except for a few years when for one reason or another Athanasius did not compose a letter. The Syriac manuscript breaks off in the middle of the letter for 348.

The extant letters are of two kinds. Most are lengthy rhetorical expositions of the meaning of the Paschal season, ending with the dates for the period of the fasting and for Easter Sunday. Two of the letters, for the years 345 and 346, are brief notices of the date for Easter Sunday, written a year in advance. It is likely that Athanasius, when not prevented by exigent circumstances, sent both kinds of letters for each year—a brief notice of next year's date, sent at the end of the current year's festival, and a full letter of exhortation sent shortly before the beginning of the fast in the current year.

In neither type of letter does the main text designate the year, but each of the letters has a chronological heading. The headings include the date of Easter in both the Egyptian and the Roman calendar, designating the year by its number in the 15-year Indiction cycle, the names of the Roman consuls for the year, and the number of the year as counted from the accession of the Roman emperor Diocletian. The headings for the years 333, 334, 335, 338, and 345–8 also include the age of the moon as of Easter Sunday.

The headings as we have them cannot be the work of Athanasius, composed at the same time as the letter. Most of the letters seem to have been written well in advance of the Lenten season, and the brief notices were written a year in advance, at the time of the preceding Easter. Athanasius could not have known the names of the consuls for the coming Roman year. The original collection of these letters in Greek was probably the work of a close associate of Athanasius, who collected and published the letters soon after the patriarch's death in AD 373. Some of the chronological headings for each letter as the Syriac text presents them may be the work of that same person, others seem to be later redactions.

In a few instances, whoever compiled the headings dated the letter incorrectly. He seems to have looked up the date for Easter at the end of the letter in an Easter table. Several years during the episcopate of Athanasius share the same date for Easter. As explained in Ch. 7, a clue to the correct date for some of the letters can be found in the instructions at the end of the letter for the beginning and end of the fast. Some letters prescribe a fast only during Holy Week, others add a 40-day Lenten fast. The former belong to the earlier part of Athanasius' career, the rest to the latter (Camplani 1993).

2. THE ATHANASIAN INDEX

The Syriac text is defective at the end, preserving nothing beyond the beginning of the letter for AD 348. There is, however, an introductory document headed

'Index' or 'List' of the Paschal letters of Athanasius. This list, numbered from 1 to 45, contains brief comments about the activities of Athanasius and gives the date of Easter for every year of Athanasius' patriarchate, from 328/9 to 372/3, including the years for which there is no letter. For those years, the author explains why Athanasius did not send a letter. The document is often referred to as 'the Festal Index' (e.g. Barnes 1978: 242). I prefer the term 'Athanasian Index'.

For each year, the Index gives information such as one would find in an Easter table, more consistently and comprehensively than in the headings. The information includes the names of the Roman consuls who entered office in January, the name of the Prefect of Egypt, a number from 1 to 15 representing the 15-year cycle of the Indiction, the date of Easter Sunday expressed in both the Egyptian and Roman calendar, the age of the moon on Easter Sunday, the age or 'epact' of the moon that defines the year, and a number from 1 to 7 labelled 'gods' and indicating what day of the week defines the year. Unlike the headings, the Index does not continuously number the years of Diocletian. The preface to the Index does, however, begin with a note on the election of Athanasius as bishop in the 44th year of Diocletian. The numbered year of Diocletian is sometimes mentioned in the historical notice for the year. Apart from the years of Diocletian and a few textual variants, the information in the Index agrees with that of the headings, including sometimes the same errors. The preface of the document shows that it was composed as an introduction to a collection of the letters. It reads as follows:

> An Index of the months of each year, and of the days, and of the Indictions, and of the Consulates, and of the Governors in Alexandria, and of all the Epacts, and of those <days> which are named 'of the gods', and the reason <any letter> was not sent, and the returns from exile, from the Festal Letters of Pope Athanasius.
>
> The Festal Letters of Athanasius, bishop of Alexandria, which he sent year by year, to the several cities and all the provinces subject to him—that is, from Pentapolis, and on to Libya, Ammoniaca, the greater and the lesser Oasis, Egypt, and Augustamnica, with the Heptanomis the upper and middle Thebais—from the 44th year of the Diocletian era, in which the Paschal Festival was on xvi Pharmuthi; xviii Kal. Mai; xviii Moon; when Alexander, his predecessor, having departed this life on xxii Pharmuthi, he succeeded him after the Paschal festival on xiv Pauni, Indict. i, Januarius and Justus being Consuls, the governor Zenius of Italy being the Praefect of Egypt, Epact xxv; Gods, i. (Translation by Archibald Robinson, *LNPNF*, Series II, iv. 497.)

There are some discrepancies between the Index as the Syriac translation preserves it and the actual collection of letters. In particular, the Index states there are no letters for the years 340/1 and 341/2. The Syriac collection includes those letters, although the letter for 341/2 properly belongs to 330/1. Also, the headings for letters 6 and 7 (333/4 and 334/5) have Philagrius as Prefect, while the Index names Paternus.

The Index may have been prepared for a collection of the letters different from the one actually preserved, and the authors of the headings and of the Index may have been different persons. Furthermore, the headings present the data in two different orders—some with the year of Diocletian as the first item after the date for Easter, others with the year of Diocletian at the end of the heading. These may also be the work of different persons (Camplani 2003: 89–95).

These issues do not affect the present discussion. I am concerned here with the structure of the Easter table that the author of the Index used.

The entries for the year corresponding to AD 338/9 can serve as an example of the chronological contents.

Heading: Consuls Constantius Augustus II, Constans I. Prefect Philagrius. Indiction 12. Easter 15 April, 20 Pharmouthi. Diocletian 55.

Index: Easter 20 Pharmouthi, Moon 20, 15 April. Epact 26, Gods 7, Indiction 12. Consuls Constantius I, Constans II. Governor Philagrius, Prefect of Egypt.

These entries are typical of the whole in having minor scribal errors. Thus, the Index has Constantius I and Constans II, instead of Constantius II and Constans I. The heading in this case omits the lunar epact for Easter Sunday. The inclusion of the lunar epact in many of the headings suggests the use of a lunar table of some kind. Unfortunately, the moons in the headings are so frequently erroneous that no table can be reconstructed from them. Since the Index has data for the years for which there was no letter and includes the epact and concurrent ('gods') for the year, its author must have used a full-fledged Paschal table.

Inspection of the relationship between the epact and the moon for Easter shows that the epact of the year is defined as of 26 Phamenoth, the date used by Anatolius, and the date implicit in the later Alexandrian cycle as we have it from Dionysius Exiguus. Similarly, the relationship between the weekday number 'of the gods' and the date of Easter Sunday shows that this parameter is defined as of 28 Phamenoth = 24 March, or some equivalent date in the Egyptian calendar—again the same as in the Easter table of Dionysius Exiguus.

The summary of events for each year in the Index is brief, sometimes limited to the statement of whether or not Athanasius was able to write a letter that year. For the years 353/4 and 371/2 the author gives no information beyond the chronological data.

The more comprehensive of these summaries sometimes confirm, sometimes supplement the information contained in a document known as the *Historia Acephala* or 'Headless History' of Athanasius. This text is a fragment of a Latin translation of a biography of Athanasius discovered by the Marchese Francesco Scipione Maffei in Verona in 1738 and sometimes referred to as 'the

Maffeian fragment'.[2] The extant portion begins with the consulship of Constantius IV and Constans III, AD 346 (hence,the term 'headless'), ending with a note on the death of Athanasius on 8 Pachon in the consulship of Valentinian IV and Valens IV (3 May 373) and his succession by Peter, Timothy, and Theophilus. The Greek original of this text was therefore probably written in the 380s.

The Index is independent of the Maffeian fragment, but probably composed about the same time. The Index sometimes dates notices by years of Diocletian—e.g. the dedication of a church in Mendidium on 14 Mesore in the 86th year of Diocletian (7 August 370)—while the Maffeian fragment uses only consular dates.

The Index to the Paschal letters of Athanasius is a crucially important document for the history of Paschal calculations, for several reasons. First, with but three exceptions, the dates for Easter Sunday are all in agreement with what the classical Alexandrian cycle as we know it through Dionysius Exiguus would produce for that same period. The exceptions reflect accommodation between Alexandria and Rome on certain points of disagreement between their traditions. Second, the numbering of the years of Diocletian at the beginning of the Index and in some of the historical notices raises the question of how and when that system emerged. Third, if the original composition of the Index belongs to the period within the first few decades after the death of Athanasius in the 370s, the author drew his data from a Paschal table earlier than any direct witness to the classical cycle. The data therefore allow us to address the question of whether the classical cycle, beginning with epact $30 = 0$ and a base-date corresponding to the first year of Diocletian, had already taken its final form in the time of Athanasius. Finally, it is from these texts that we learn not only the correct date for the Council of Sardica, but also that the Council took up the problem of Paschal calculations and agreed upon dates for Easter Sunday for the next 50 years.

3. ACCOMMODATIONS WITH ROME

The *Chronograph of 354* preserves a list of dates for Easter as observed at Rome between 312 and 354, with a projection forward to the year 411 (Mommsen 1892: 62–4). Comparison of that list with the Alexandrian dates given in the Index shows that Athanasius sometimes abandoned the Alexandrian rules and deferred to Rome. On other occasions, the two churches observed Easter on different dates—probably because Athanasius was in exile during those years and unable to effect a compromise.

[2] Maffei 1740: iii. 60–92.

i. The Year 333

For the year 333, the Index gives the epact as 20, in agreement with the corresponding year in the cycle of Dionysius Exiguus. The epact 20 as of 26 Phamenoth produces a 14th day of the Paschal moon on 20 Pharmouthi, 15 April. The weekday parameter for that year is 7, so 28 Phamenoth = 24 March was a Saturday. Accordingly, 15 April was a Sunday. By the rule later in effect and supposedly sanctioned by the Nicene prohibition against observing Easter with the Jews, Easter Sunday should have been postponed from 15 April to 22 April. Both the heading and the Index give the age of the moon on Easter Sunday as 15, instead of the 14 that the epact 20 requires. Yet we cannot correct the epact to 21, for the epact 20 also appears in the Index at the intervals of 19 and 38 years later, for the years 352 and 371. Eduard Schwartz (1905: 26) suggested that the compiler of the headings and the Index was troubled by the date and 'corrected' the epact from 14 to 15.

The letter of Athanasius for this year is extant. Athanasius does not remark upon the date as unusual in any way. I have argued in Ch. 8 that the Alexandrian rule prohibiting the observance of Easter before the 15th day of the moon goes back to Anatolius, but that his calculations of the epact were no more than a guide for the bishop. When the 14th day of the moon fell on a Sunday, the bishop could exercise his discretion in deciding whether or not to postpone the observance to the next week. Peter, in prescribing Easter for the year 309 on 15 Pharmouthi = 10 April, seems already to have permitted Easter Sunday to coincide with what Anatolius calculated as the 14th day of the moon. In 333, only eight years after the Council of Nicaea, the rule against observing the Pasch according to the custom of the Jews was apparently not yet interpreted as an absolute prohibition of an observance on the 14th day of Nisan. Athanasius had the same discretion that Peter did.

We do not know what Peter's reasons were for the year 309. For the year 333, however, Athanasius was probably making an accommodation to Roman tradition, as was clearly the case for the years 346 and 349. As we shall see, Roman practices prohibited the observance of Easter after 21 April. The *Chronograph of 354* reports a date for Easter in 333 on *XVII Kal. Mai.*, 15 April.

ii. The Year 343

According to entries in the Index for the years 338/9 and 345/6, Athanasius was in exile between 339 and 346. The Index gives the date for Easter of 343 as 27 March. At Rome, according to the *Chronograph of 354*, Easter was observed the following week, on 3 April. Because Athanasius was in exile, no accommodation was reached between the two cities. The reason for the difference is that the Roman calculations placed the 14th day of the moon on Saturday, 26 March, but prohibited the observance of Easter before the 16th day of the moon. It was during this year, according to the Index, that the Council of Sardica met. I shall argue later that Athanasius sought to justify the Alexandrian date by changing the epact for the year so as to make 27 March the 16th day of the moon.

iii. The Year 346

According to the Index, Athanasius was in exile in Italy at Aquileia at Eastertide of 345 when he sent a short letter to the presbyters and deacons of Alexandria asking them to give notice that Easter for the year 346 should be observed on 4 Pharmouthi, 30 March. Athanasius is explicit in his letter that the date he prescribes is a departure from Egyptian practice, which would set Easter Sunday on 27 Phamenoth, 23 March. He says that the date was discussed at a synod and that all agreed that 23 March would be too early and Easter should be deferred to 30 March.

The synod to which Athanasius refers must be that held at Sardica, which the author of the Index dates to the year 342/3, stating that the participants made an agreement about the dates for Easter, which was to be binding for the next 50 years. I shall return to that agreement later.

As we shall see, 23 March was within the Roman limits for the observance of Easter. It was, however, the 15th day of the moon, in both the Roman and the Alexandrian calculations for that year. The Index gives the epact for the year as 14, in agreement with the classical cycle. As we know from the Easter table of Hippolytus, Roman practice postponed Easter a week when it would fall on the 15th day of the moon (see Ch. 7). Victorius of Aquitania, in the introduction to his Paschal table (Krusch 1938: 19), is explicit that the Roman church preferred to postpone Easter to the 22nd day of the moon rather than to permit Easter to precede the 16th day.

Although the Index gives the epact for the year as 14, both the heading and the Index express the moon for Sunday, 30 March, as 21, instead of 22. The Romans permitted moon 22, the Alexandrians normally did not. As for the year 333, the compiler seems to have amended the number.

iv. The Year 349 and the Roman Limits for Easter

The reason for accelerating the date of Easter from 22 April to 15 April in 333 appears in a partially corrupt text of the Index for the year 349. Unfortunately, the letter for that year is not preserved, as the Syriac fragments end in the middle of the letter for the preceding year. The compiler of the Index gives the epact for the year 349 as 17, in agreement with the later Alexandrian cycle. This means that a full moon had already occurred before the equinox and that the Paschal moon should therefore be that of the following month, on 23 Pharmouthi, 18 April, with Easter on 23 April. The Index states that Easter was actually observed on 30 Phamenoth, 26 March, because the Romans objected to the late date in April. The Romans held a tradition from the time of Peter, the author adds, not to observe Easter after 26 Pharmouthi, 21 April. What follows is a text too corrupt to permit certainty about its original intent. It says something about the 30th of Phamenoth, the 21st day of the moon, and the 7th day before the Kalends of April (26 March).

Some scholars have understood the reference to 30 Phamenoth as expressing the upper limit of the Roman observance—Easter should be observed not earlier than 26 March nor later than 21 April. On this interpretation, the author of the Index misunderstood the Roman tradition, in which the earliest date for Easter was actually 25 March.[3] As we shall see, however, Pope Leo, in a letter to Marcian, cited this ancestral tradition as limiting Easter to the period between 22 March and 21 April. I shall argue in Ch. 11 that the Roman church never used a calculation that set the earliest date for Easter on 25 March, the Roman date of the equinox.

Most likely, the reference to 30 Phamenoth = 26 March in the text of the Index has nothing to do with the tradition from Peter, but only repeats that the actual observance was on that date in the year 349.

Moon 21 fits 26 March for a year with epact 17 on 22 March. At the beginning of the notice the Index gives the moon for Easter Sunday as 19, which would fit an Easter date on 23 April. Perhaps the author read that number from a table and forgot to correct it to reflect the decision to observe Easter during the previous moon.

The same problem arose 95 years later for the year corresponding to AD 444. Paschasinus of Lilybaeum wrote to Pope Leo urging him to accept the Alexandrian date, and Leo apparently did so.[4] A late date for Easter was also prescribed in the Alexandrian tables for 455. Again, Leo yielded, but not without protest. We have the letter he wrote asking the emperor Marcian to resolve this issue, and in that letter Leo explicitly states what the Roman limits were for the observance of Easter. Easter Sunday may not be observed before *XI Kal. Apr.* (22 March) nor after *XI Kal. Mai.* (21 April).[5]

A note in the *Chronicle* of Prosper of Aquitania at the year corresponding to AD 444 (Mommsen 1892: 479) reveals the reason for the Roman reluctance to

[3] MacCarthy 1901: lxxv, lxxviii. [4] Krusch 1880: 247–50; see Ch. 4.

[5] Leo to Marcian, Letter 121; Krusch 1880: 259.

permit the observance of Easter after 21 April. In that year, Prosper says, Good Friday was observed on 21 April and Easter Sunday on 23 April, for which reason the city's natal day passed without the usual circuses. Ideler inferred that the Roman limit arose from the fact that the ancient Roman festival of the Parilia was observed on 21 April, the traditional birth date of Rome. The church would want to avoid any intrusion into Holy Week of the sometimes wild festivities associated with the Parilia.[6]

v. The Year 350

For the year 350, the Index gives the date for Easter as 13 Pharmouthi, 8 April, in agreement with the classical cycle. That was the 15th day of the moon. At Rome, according to the *Chronograph of 354*, Easter was observed on 15 April. Why the two cities should have observed Easter on different dates in that year, when there had supposedly been agreement at Sardica on dates for the next 50 years, we do not know. Schwartz suggested (1905: 51) that the usurpation of Magnentius at Rome in January of 350 disturbed relations between Rome and Alexandria.

vi. The Year 360

For the year 360, the Index has Easter on 23 April, the 21st day of the moon, in agreement with the later Alexandrian cycle, but exceeding the Roman limit of 21 April. The list of Easter dates in the *Chronograph of 354* prescribes 16 April for that year, as does the Roman 84-year cycle (see Ch. 11). Schwartz (1905: 52) suggested that because Athanasius had again been forced out of the city and was in hiding during this period his opponents in Alexandria made no accommodation with Rome on the date for Easter. According to St Ambrose, the church at Milan also observed Easter on 23 April in 360.[7] The bishop at the time was Auxentius, accused by his adversaries of introducing Arianism to the west (Socrates 2. 37). Auxentius perhaps wished to assert his independence from Rome. The Roman festival of Parilia on 21 April was of no concern to the Milanese in any case. The late date was the same issue that prompted 95 years later the correspondence of Leo with the emperor Marcian.

[6] Ideler 1825–6: ii. 226; so also Jones 1943: 28; Wallis 1999: xxxix; Declercq 2002: 173.
[7] Letter on Easter (*Extra Collectionem* 13. 21).

vii. The Year 340

One other Easter date is worth noting, although it does not fall under the rubric of accommodations with Rome. According to the Index, the opponents of Athanasius were in control of Alexandria, under their bishop Gregory of Cappadocia, from 22 March 339, to 21 October 346. For the year 340 they announced that Easter Sunday would be 27 Phamenoth (23 March) and were much derided for their error. In the middle of Lent, they changed their mind and decided to observe Easter on 4 Pharmouthi (30 March), which was the orthodox date. Athanasius was unable to write the customary Paschal letter, the compiler says, but did give notice of Easter in a short note to the presbyters of Alexandria. Unfortunately, the Syriac text does not include that short note. On what basis Gregory would have chosen 23 March we do not know. In the Alexandrian calculation, the 14th day of the moon was 29 March. The list of Paschal full moons that the eastern bishops brought with them to Sardica two years later also has the 14th day of the moon for the year 340 on 29 March (see Table 7). The *Chronograph of 354* says that Easter was observed in Rome on 30 March in that year. Perhaps Gregory of Cappadocia, in the first year of his usurpation, simply wanted to announce a date different from that of Athanasius.

4. THE ERA OF DIOCLETIAN

i. Numbered years in the Alexandrian cycle

The Alexandrian cycle, as Dionysius Exiguus knew it in its definitive form, numbered the years from Diocletian, with the first year of the cycle corresponding at 19-year intervals to the first year of Diocletian. The headings for the letters of Athanasius number the years from Diocletian. The compiler of the Index dated the accession of Athanasius to the 44th year of Diocletian (AD 327/8) and included the numbered year from Diocletian in the historical notes for the years 328/9, 368/9, and 369/70. The presence of such dates in the headings and the Index, but their absence from the *Historia Acephala*, suggests that the compiler drew them from the Paschal table with which he was working.

Numbered years from Diocletian, clearly derived from an Alexandrian Easter table, appear also in the letter of Ambrose mentioned above. Ambrose is discussing the proper date of Easter for the year AD 387, when the 14th day of the moon would fall on Sunday, 18 April. Ambrose urges the bishops of Aemilia, to whom the letter is addressed, to postpone the observance of Easter to the next Sunday, 25 April. He explains the rule prohibiting the observance of Easter earlier than the 15th day of the moon on the grounds that Christ was crucified at the time of the Passover, while Easter celebrates the Resurrection and must therefore come after the Passover. He cites several precedents, referring to the 19-year cycle that he says the Council of Nicaea authorized and to the calculations of Egypt based upon that cycle. Recent precedents include the 89th year of Diocletian (372/3), when the 14th day of the moon fell on 24 March and the Alexandrians, in agreement 'with us', Ambrose says, celebrated Easter on 31 March. Again, in the 93rd year of Diocletian (376/7), he says, when the fourteenth moon fell on 14 Pharmouthi, which is the 9th of April, and was the Lord's day, Easter was kept on the 21st day of Pharmouthi, the 16th of April. Finally, he refers to a precedent in the 76th year of Diocletian (AD 359/60), when 'our ancestors' had no hesitation about observing Easter on 28 Pharmouthi, 23 April.[8] Easter on 23 April in that year was not a case of Sunday postponement (as Ambrose alleges) under the Alexandrian rule, but Auxentius did postpone Easter a week in comparison with the Roman observance.

The use of the era of Diocletian in these early references to the Paschal calculations of Alexandria has led scholars to believe that the Alexandrian cycle had already taken its definitive form during or shortly after the reign of Diocletian.

Ludwig Ideler (1825–6: i. 161–2, ii. 231–2) suggested that Diocletian made such an impression upon the Egyptians with his many reforms and impositions that people began to reckon dates accordingly. This folk-practice influenced the Paschal calculations, and it was from that source in turn that the first year of Diocletian came into general use as an era. In a situation analogous to the gradual adoption in Europe of the Christian era of Dionysius Exiguus, Ideler argued, the era of Diocletian found its way from the Easter tables into more general usage in Egypt. Ideler thought that the Christians would never have numbered the years in their Easter tables by reference to Diocletian unless the Easter tables were in fact composed during his reign.

In his discussion of Egyptian chronology, Ginzel (1906–14: i. 229–31) was more circumspect, stating that the origins of the era of Diocletian are obscure. He agreed with Ideler that the usage probably arose among the people because the reforms of Diocletian left an indelible memory of that emperor. Ginzel also noted the use of numbered years of Diocletian for dating astronomical observations and suggested that it was this usage that influenced the compilers of the Paschal tables. In his discussion of Paschal calculations published a few years later (1906–14: iii. 135), Ginzel stated that the choice of the first

[8] Ibid. §§14, 21.

year of Diocletian as the base-date for the Alexandrian 19-year cycle was founded on the Alexandrian civil year, with a new moon coinciding with the first day of Thoth in the first year of Diocletian.

André van de Vyver (1957: 12) was explicit that 'the Alexandrian era of Diocletian was created' in connection with a reform of the Anatolian cycle during the reign of that emperor. Grumel (1958: 36) attributed the reform to the patriarch Peter, based on actual observation of the first crescent of the new moon on 1 Thoth = 29 August in the 20th year of Diocletian, AD 303/4.

Outside the Easter tables, the numbering of a year by reference to Diocletian appears in horoscopes for birthdates from as early as AD 304/5 (Bagnall and Worp 2004: 63). Since that was the last year of Diocletian, the appearance of his regnal year in a dating formula is not remarkable, even if the horoscope was not cast until well after his abdication and death. Diocletian resigned as emperor after 20 years of rule in 305 (Lactantius 19. 1). Another horoscope is for a man born on 28 Thoth in the 33rd year of Diocletian, AD 316/17 (Grenfell 1894). An inscription honouring the last sacred bull of Armant records its death on the 8th day of Athyr in the 57th year of Diocletian, 4 November AD 340 (Grenier 1983). The astronomer Theon reports observations for the 10th day of Tybi in the 39th year of Diocletian (AD 322/3) and the 22nd day of Thoth in the 77th year (AD 360/1).[9]

If the Alexandrian Easter tables had been reformed, with its first year now corresponding to the first year of Diocletian, in the year 303, as Grumel argued, or about 320, as Schwartz maintained, then its use in the Easter tables would in fact predate any other known reference to years numbered from Diocletian after his abdication in 305. I have argued in Ch. 8 that the cycle of Anatolius was less radically different from the classical cycle than scholars have thought. In particular, there had been no change in the date of the equinox between the time of Anatolius and that of Athanasius. Absent that pretext for a reform, the appearance of numbered years of Diocletian in the Easter tables of fourth-century Alexandria does not in itself imply a recalibration of the cycle such that its first year now coincided with the first year of Diocletian. As we shall see in Ch. 10, the earliest evidence for such a cycle appears only in the time of Theophilus and Cyril.

ii. The Reforms of Diocletian

The era of Diocletian arose for reasons having nothing to do with the epacts of the moon, whether connected with Paschal calculations or not. According to

[9] Theon, *Commentary on the Almagest*, p. 908; *Lesser Commentary on the Handy Tables*, p. 205.

Eutropius (9. 23), after Diocletian reconquered Egypt in the 290s, 'he used his victory cruelly and distressed all Egypt with severe proscriptions and massacres. Yet at the same time he made many judicious arrangements and regulations, which continue to our own days.'

Among the reforms of Diocletian was a reorganization of the administrative structure of the empire. Provinces were divided into smaller units and grouped together for administrative purposes into twelve dioceses. The sources for these arrangements are scattered and the chronology problematic (Lo Cascio 2005). The earliest notice is a censorious remark of Lactantius (7. 4) to the effect that Diocletian divided the provinces into tiny crumbs under a multitude of presidents and vicars. A seventh-century document known as the *Laterculus Veronensis* (Verona List) lists the dioceses and their provinces as of the early fourth century (Mommsen 1862, Bury 1923). Egypt was originally divided into two provinces within the Diocese of the Orient (Hendy 1972).

Under these new arrangements, as continued and modified by Diocletian's successors, Egypt lost its special status as a royal province ruled directly by the emperor as successor to the pharaohs. Diocletian and Maximin Daia (308–13) are the last emperors for whom a 'royal cartouche' is preserved in hieroglyphic texts (Grenier 1983). Diocletian also seems to have required that henceforth the Egyptians should follow the official Roman consular year, instead of dating by reference to numbered years of the ruler, as had been the custom in the past. Consular dates are normal in documents beginning in AD 293.[10]

Diocletian was the last of the emperors whose regnal years were registered in the traditional style. It was natural, therefore, for Egyptian chronological texts—unofficially, at least—to continue the numbering of his years even after his resignation as emperor in 305. Similarly, after the Roman consulship ended with Basil in AD 541, some chronological texts simply numbered the years 'after the consulship of Basil'.[11]

iii. The Astronomical Canon and the Roman Consular Year

Bickerman (1968: 72) commented that the introduction of the Roman consular year 'inconvenienced the astronomers, since all astronomical observations were noted according to the Egyptian mobile year. Thus the astronomers continued, even after Diocletian's abdication, the fictitious numbering of the years of his reign.'

[10] Bagnall and Worp 2004: 3, 88.

[11] See for example the Paschal list of Victorius of Aquitania, Mommsen 1892: 732–5.

Bickerman did not explicate the point. Previously, observations had been noted by the date in the mobile calendar and the regnal year of the ruler, with a running total for the purpose of long-term calculations from Nabonassar or from the death of Alexander, or both. Thus, Ptolemy's observation of the equinox in the year corresponding to AD 140 (*Almagest* 3. 1) is dated to the 3rd year of Antoninus, the 463rd year from the death of Alexander, on the 9th day of Pachon. Although the fixed Julian year had been introduced in the time of Augustus, Ptolemy never uses it.

Theon, working after the reforms of Diocletian, dated his observations not by the year of the current ruler, but by years of Diocletian. Theon also gave dates in both what he calls the (mobile) 'Egyptian' calendar and the (fixed) 'Alexandrian' calendar. Thus, he dated some observations to the 39th year of Diocletian, the 10th day of Tybi 'according to the Alexandrians or the Greeks, the 5th day of Pharmouthi according to the Egyptian reckoning' (*Commentary on the Almagest* 908). Dating by reference to the years of Diocletian permitted Theon to continue using the Egyptian calendar, both fixed and mobile, even after Diocletian had abolished the practice officially.

The use of the Roman consular year in official documents required the astronomers to supplement their 'royal canon' with a list of the Roman consuls numbered in such a way as to facilitate cross-reference between the two chronological systems. The earliest such list has the names of the Roman consuls from Antoninus Pius and Camerinus (AD 138) to Modestus and Arintheus (AD 372). Since the list ends in 372 and we know that Theon was working at that period, scholars have attributed the document to him and refer to it as the *Fasti Theonis Alexandrini*.[12] There are two columns of running numbers. The first is headed 'Years from Alexander' and numbered from 461 to 695. The second is headed 'Years from Augustus' and numbered 167 to 401. A column of running totals from the death of Alexander also appears in the Astronomical Canon. Theon could therefore easily correlate consular years with regnal years. Theon perhaps compiled this list in connection with his commentary on Ptolemy's *Almagest*, for it was during the reign of Antoninus Pius (138–61) that Ptolemy made most of his observations.

The most comprehensive consular list from an Alexandrian source begins in the year 252 from Augustus (AD 222), with the consulship of Antoninus (Elagabalus) IV and Alexander Severus, and continues, with one name omitted, to the year 659 (AD 630). The years from the consulship of Basil in AD 541 to the end of the list are marked 'non-consular'. Since it ends in the time of the emperor Heraclius, the list is known as the *Fasti Heracliani*.[13] Its author was

[12] Van der Hagen 1735; H. Usener, Mommsen 1898: 359–81.
[13] ed. H. Usener, Mommsen 1898: 386–410.

probably the scholar Stephanus of Alexandria, who is known to have worked during the reign of Heraclius.[14]

There are interesting differences between the earliest portion of the list, up to the time of Diocletian, and the remainder, from Diocletian to the end of the list. In the earlier portion, in the margin to the left of the consular names, the names of the emperors are entered at the year of their accession with the number of years each ruled. To the right of each consular pair of names are two columns of numbers. The first numbers the years of the emperors beginning with the first year of Alexander Severus. The second column gives a running total of years from Augustus at 10-year intervals. The numbering of the years of the emperors begins again at 1 with the accession of each emperor until the time of Diocletian. The consular names generally appear in the nominative case, as in the *Fasti Theonis*.

From the first year of Diocletian the structure of the list is different. The consular names are now generally in the genitive case. There is a note stating that 607 years have elapsed from Philip (Philip Arrhidaeus, the successor of Alexander the Great) to Diocletian. Henceforward the left margin numbers years of the Indiction, from 1 to 15, instead of the years of the emperors. The two columns to the right now give running totals of years elapsed since the first year of Diocletian in the first column, years from Philip in the second column. Thus the earlier portion of the document resembles a list of consular names (in the nominative case) to which the numbered years from Augustus are appended. From the first year of Diocletian it looks more like a list of numbered years, with the consular names in the genitive, as in a dating formula. In Greek, such formulae use the grammatical construction known as genitive absolute, as in the consular list of the *Chronicon Paschale*, in Latin an ablative absolute, as in the consular lists of the *Chronograph of 354*, Prosper, and Victorius.

Stephanus is also most likely the author of the oldest extant version of the royal canon. This list of rulers begins with Nabonassar and continues through the emperor Phocas (602–10).[15] The compiler therefore was working during the reign of Heraclius (610–41). Next to the names are two columns of numbers. The first lists the number of years assigned to each ruler. The second gives a running total accumulating 424 years to the death of Alexander. At the first year of Philip, the column of totals begins again at 1 and continues to 933. Thus, the first section of the list runs from 747 to 324 BC and the second from 324 BC to AD 609. Marginal notes inform us that the astronomer Timocharis

[14] ed. H. Usener, Mommsen 1898: 362, 368, 386.

[15] Ibid. 447–9.

lived in the time of the first Ptolemy (305–285 BC) and that Pappus 'wrote' either 'in' or 'until' the reign of Diocletian.[16]

The Byzantine encyclopaedia known as the *Suda* says of Pappus that he was a contemporary of Theon and lived in the time of the emperor Theodosius (AD 379–95).[17] That date is probably too late. On the basis of the note in the Astronomical Canon, Usener (Mommsen 1898: 361) dated Pappus to the reign of Diocletian. Adolphe Rome inferred from the sixth book of Pappus' *Commentary on the Almagest* that Pappus discussed an eclipse of the sun on 18 October 320.[18] Pappus therefore was at work in the 320s or later. Theon's reference to observations in the 39th year of Diocletian probably derives from Pappus.

Usener (Mommsen 1898: 390–1) accounted for the differences between the earlier and later portions of the *Fasti Heracliani* by suggesting that Stephanus replicated one source up to the time of Diocletian and compiled the rest himself. Perhaps so. The inclusion of a column for years of Diocletian, however, is likely to have been present already in his sources. The ultimate source for the consular list from the first year of Diocletian until about 340 may well have been Pappus. Thus the marginal note in the Astronomical Canon can be interpreted as meaning that Pappus maintained the Royal Canon up to the time of Diocletian, but continued it in a modified form, with a consular list numbered from the first year of Diocletian such as we find in the *Fasti Heracliani*. When Theon a few years later compiled his own consular list, he began the list from the time of Claudius Ptolemy. He therefore numbered the list from Augustus and did not find it necessary to add a new column at the first year of Diocletian. In recording his observations, however, he followed the example of Pappus and numbered the years from Diocletian.

It may well be the case that Pappus, Theon, and their immediate successors did not maintain the Astronomical Canon at all after the time of Diocletian. They maintained a consular list instead, continuing the numbering of the years from Diocletian. It was not until after the decree of Justinian (*Novella* 47, 31 August 537) requiring the inclusion in dating formulae of the emperor's regnal year and the disappearance of consular dating shortly thereafter that maintenance of the Astronomical Canon again became desirable. Stephanus apparently took up that task.

The era of Diocletian arose in response to the introduction of consular dating and the loss of Egypt's special status as a royal domain. For those who used the Egyptian calendar and the Alexandrian civil year, the numbering of the years from Diocletian, even after his resignation and death, was the

[16] Ibid. 448. 4, 449. 7. [17] *Suda*, pi, 265.
[18] Rome 1931: x–xiii; Neugebauer 1975: 975–66; Espenak and Meeus 2006: #05529.

continuation of earlier practice. The presence of numbered years of Diocletian in the Paschal lists of Alexandria does not imply that those tables were composed during the reign of Diocletian, much less that they were reformed at that time to move the first year of the cycle from the new moon of 26 Phamenoth to the new moon of 1 Thoth.

The fact that one could have observed the first crescent of the new moon on 1 Thoth in the 20th year of Diocletian is irrelevant. As Otto Neugebauer remarked (1979*a*: 97–8), the idea that Paschal calculators determined the first year of a cycle by reference to actual observation of the moon is mistaken—these tables are numerical exercises bearing little relationship to astronomical science. As I shall argue in Chs. 10 and 16, the coincidence between the first year of a cycle and the first year of Diocletian with a calculated new moon on 1 Thoth was the fortuitous result of other considerations. There was no need for fourth-century reformers to recalibrate the cycle so as to take into account the Alexandrian civil calendar. By making 26 Phamenoth the seat of the epact, equivalent to the last day of the previous year, Anatolius had already calibrated the cycle to the civil year.

5. THE LUNAR EPACTS IN THE ATHANASIAN INDEX

Neither the equinoctial date of 21 March implicit in Athanasius' letter for the year 338 (Easter 26 March) nor the appearance of numbered years from Diocletian in the headings implies that the Anatolian cycle had been reformed by the time of Athanasius so as to produce the Alexandrian calculations in the definitive form that we know from Dionysius Exiguus. The next question is whether the epacts to which the headings and Index attest conform to the classical cycle, to the cycle of Anatolius, or to some structure intermediate between the two.

Table 6 collects the data from the Index and the headings and compares them with both the classical cycle as we know it from Dionysius Exiguus and the cycle of Anatolius as reconstructed in Ch. 8.

There are several discrepancies and inconsistencies in the lunar data for Easter Sunday. Some result from scribal error, some from a deliberate decision to change the moon for Easter Sunday to bring it into conformity with rule. At the year 49 of Diocletian, AD 333, the epact is 20, producing a 14th day of the moon on Sunday, 15 April, which would normally require postponement of Easter to 22 April, moon 22. Athanasius decided instead to prescribe Easter for 15 April, in agreement with Rome. Since moon 14 is not usually permitted,

Table 6. Athanasian Index and Headings, compared with Anatolian and classical cycles

AD	Diocl.	Epact Index	Epact Anat.	Epact Class.	Easter Index	Easter Class.	Moon Head	Moon Index	Moon Anat.	Moon Class.
328	44	25	25	25	19 Pharm	19 Pharm	—	18	18	18
329	45	6	6	6	11 Pharm	11 Pharm	—	21	21	21
330	46	17	17	17	24 Pharm	24 Pharm	—	15	15	15
331	47	28	28	28	16 Pharm	16 Pharm	—	18	18	18
332	48	9	9	9	7 Pharm	7 Pharm	—	20	20	20
333	49	20	20	20	20 Pharm	27 Pharm	15	15	21	21
334	50	1	1	1	12 Pharm	12 Pharm	—	17	17	17
335	51	12	12	12	4 Pharm	4 Pharm	20	20	20	20
336	52	23	23	23	23 Pharm	23 Pharm	—	20	20	20
337	53	4	4	4	8 Pharm	8 Pharm	—	16	16	16
338	54	15	15	15	30 Pham	30 Pham	18½	19	19	19
339	55	26	26	26	20 Pharm	20 Pharm	—	20	20	20
340	56	7	7	7	4 Pharm	4 Pharm	—	15	15	15
341	57	18	18	18	24 Pharm	24 Pharm	—	16	16	16
342	58	29	29	30	16 Pharm	16 Pharm	—	16	19	20
343	59	11	10	11	1 Pharm	1 Pharm	—	15	15	16
344	60	21	21	22	20 Pharm	20 Pharm	—	19	15	16
345	61	2	3	3	12 Pharm	12 Pharm	19	18	18	19
346	62	14	14	14	4 Pharm	27 Pham	21	24	15	15
347	63	25	25	25	17 Pharm	17 Pharm	15	15	16	16
348	64	6	6	6	8 Pharm	8 Pharm	18	18	18	18
349	65	17	17	17	30 Pham	28 Pharm	—	19	19	19
350	66	28	28	28	13 Pharm	13 Pharm	—	19 + 2 h	15	15
351	67	9	9	9	5 Pharm	5 Pharm	—	18	18	18
352	68	20	20	20	24 Pharm	24 Pharm	—	18	18	18
353	69	1	1	1	16 Pharm	16 Pharm	—	21	21	21
354	70	12	12	12	1 Pharm	1 Pharm	—	17	17	17
355	71	23	23	23	21 Pharm	21 Pharm	—	18	18	18
356	72	4	4	4	12 Pharm	12 Pharm	—	17	20	20
357	73	15	15	15	27 Pham	27 Pham	—	17	16	16
358	74	26	26	26	17 Pharm	17 Pharm	—	17	17	17
359	75	7	7	7	9 Pharm	9 Pharm	—	20	20	20
360	76	18	18	18	28 Pharm	28 Pharm	—	21	20	20
361	77	29	29	30	13 Pharm	13 Pharm	—	17	16	17
362	78	10	10	11	5 Pharm	5 Pharm	—	25	19	20
363	79	21	21	22	25 Pharm	25 Pharm	—	20	20	21
364	80	3	3	3	9 Pharm	9 Pharm	—	16	16	16
365	81	14	14	14	1 Pharm	1 Pharm	—	19	19	19
366	82	25	25	25	21 Pharm	21 Pharm	—	20	20	20
367	83	6	6	6	6 Pharm	6 Pharm	—	16	16	16
368	84	17	17	17	25 Pharm	25 Pharm	—	16	16	16
369	85	28	28	28	17 Pharm	17 Pharm	—	15	19	19
370	86	9	9	9	2 Pharm	2 Pharm	—	15	15	15
371	87	20	20	20	22 Pharm	22 Pharm	—	16	16	16
372	88	1	1	1	13 Pharm	13 Pharm	—	19	18	18
373	89	12	12	12	5 Pharm	5 Pharm	—	21	21	21

Schwartz (1905: 26) argued that the compiler of the Index and the heading decided to express the moon as 15.

For the year 338, the Index agrees with the classical cycle in dating Easter to 30 Phamenoth = 26 March, moon 19. The heading gives the lunar epact as 18½. Moon 19 on 30 Phamenoth entails moon 14 on 25 Phamenoth = 21 March, the date of the equinox. Schwartz (1905: 18) suggested that the author of the heading wanted to assure the reader that the Paschal full moon had not occurred before the equinox. Schwartz believed that 338 was the first year when the 14th day of the moon fell on 25 Phamenoth, after a reform of the cycle that changed the date of the equinox from 26 Phamenoth to 25 Phamenoth. As I have argued in Ch. 8, 25 Phamenoth was already the recognized date of the equinox in the cycle of Anatolius. Schwartz may well have been right, however, that the epact of 18½ was intended to bring the Paschal full moon well within the required limit.

For the year 66, AD 350, the epact is 28, which entails moon 15 for Easter Sunday on 8 April. The Index has Easter on moon 19 'at the second hour'. The symbols in Greek for 9 (θ) and 5 (ε) are easily confused, so the epact must originally have read 15. Schwartz (1905: 31, 51) suggested that the compiler added the second hour in order to bring the age of the moon into conformity with the Roman limit of 16. That is, moon 15 plus 2 hours means that Easter Sunday included at least part of the 16th day of the moon.

At the year Diocletian 62, the Index has epact 14, in agreement with the later cycle, but gives the moon for 30 March as 24. The heading has Moon 21. Again, the symbols for 21 and 24 are easily confused in Greek. Moon 24 on Easter Sunday is never permitted. The original must therefore have read 21. Yet the correct moon for 30 March in a year with epact 14 is 22. The compiler of the headings and the Index changed it to 21 to make the date conform to the usual lunar limits. At the year 63 of Diocletian, the Index and the classical cycle agree in giving the epact as 25 and the date for Easter as 12 April. From the epact of 25 on 22 March, it follows that the age of the moon on 12 April is 16, yet both the heading and the Index erroneously calculate it as 15. We cannot 'correct' the epact to 26 to produce moon 15, because the Index has epact 25 also 19 years earlier.

The epacts are less liable to transcriptional error or purposeful 'correction' than are the moons for Easter Sunday. The epacts follow one another in a regular order, advancing by 11 each year except at the position of the *saltus*. The epacts given by the Index agree with those both of Anatolius and of the later cycle at every year, except for two clusters of variants appearing at an interval of 19 years at the years corresponding to AD 342–5 and 361–4. This is precisely the portion of the cycle where the *saltus* appears, at the years corresponding to 342 and 361 in the classical cycle, 345 and 364 in the cycle of Anatolius as I have reconstructed it in Ch. 8.

For 342 to 345, the Index has epacts 29, 11, 21, and 2, with moons on Easter Sunday of 16, 15, 19, and 18. The corresponding numbers in the classical cycle are 30, 11, 22, and 3 for the epacts, 20, 16, 16, and 19 for the moons. The Anatolian cycle would have epacts 29, 10, 21, and 3, with the age of the moon on Easter Sunday at 19, 15, 15, and 18.

For 361 to 364, the epacts in the Index are 29, 10, 21, and 3, with moons 17, 25, 20, and 16. The classical cycle has 30, 11, 22, and 3, with moons 17, 20, 21, and 16. The Anatolian cycle produces epacts 29, 10, 21, and 3, with moons 16, 19, 20, and 16.

The moons for Easter Sunday are so irregular here and so liable to corruption elsewhere in the list that we must ignore them for the purposes of determining the original sequence of epacts in the tables from which the data were taken.

Schwartz believed that the Alexandrian cycle had taken its final form by the 320s and interpreted the Athanasian Index accordingly. In footnotes to his reconstruction of the original Greek table, Schwartz (1905: 24–5) suggested that the compiler or translator forgot to increment the epact by 12 between the entries for 341–342 and 360–361 and so wrote 29 instead of 30. He did not fully recover from the error until the entries for 346 in the former instance, 364 in the latter.

Schwartz was certainly correct to suspect that confusion arising from the intervention of the *saltus* is responsible for these two sets of errors at an interval of nineteen years. The evidence of the Syriac text suggests, however, that the *saltus* appeared after epact 29. The text reads 29 at both 342 and 361, with the variants appearing in the immediately succeeding years. Therefore the original sequence of epacts was 29, 11, 22, and 3. The compiler (or whoever is responsible for the errors) correctly read 11 for the year 343, but then thinking that this must be a mistake reverted to the sequence of epacts that would follow 29 in increments of 11, writing 21 for 344 and 2 for 345. By the time he arrived at the entry for the year 346, he realized that the epact 14 must be correct, because the epact for the succeeding years advanced regularly in increments of 11. Nineteen years later, he increased the epact in increments of 11 from 29 to 10 to 21, realizing at the year 364 that the epact of 3 must be correct.

In concluding that the original tables had the sequence 29, 11, 22 at these years, I have the support of Micheline Albert and Annik Martin (1985: 241), the most recent editors of the Syriac text. With this sequence, the Athanasian Index agrees neither with the classical cycle (30, 11, 22) nor with the cycle of Anatolius (29, 10, 21). It does agree, however, with the 95-year cycle published by André van de Vyver in 1957 (see Ch. 8). The cycle numbers the years from Diocletian and covers the period from 145 through 239. The preface, however, states that the 95-year period begins in the 50th year of Diocletian, AD 334. It accordingly has a base-date corresponding to the first year of the cycle of Anatolius in AD 258.

Albert and Martin do not refer to van de Vyver's work, nor does van de Vyver refer to the Athanasian Index. The fact that the table underlying the Paris text originally began with the 50th year of Diocletian, during the episcopate of Athanasius, and presents epacts in agreement with those of the Athanasian Index suggests that the 95-year table of the Paris text in fact represents the cycle of Athanasius.

Two inferences are possible. The first is that the Athanasian cycle was identical to that of Anatolius. It had a base-date corresponding to AD 258 and the sequence 29, 11, 22, with the *saltus* therefore appearing at the 10th year between epacts 29 and 11. I have argued in Ch. 8 that a *saltus* at that position violates the structure of the 19-year cycle. A *saltus* at the 12th year is structurally more logical and will also explain some aspects of the later history of the cycle.

The second conclusion is therefore preferable. The Athanasian cycle represents an intermediate stage in the development of the cycle. Athanasius retained the cycle of Anatolius with epact 1 in its first year, advancing by 11 each year to epact 29. He decided to change the epacts for the following two years from 10 and 21 to 11 and 22, in an effort to reach accommodation with Rome. Since Athanasius was not the original designer of the cycle, the structural deficiency of the new sequence was not apparent to him and would probably not have mattered much to him anyway. It was the Council of Sardica that provided the occasion for these changes to the original cycle of Anatolius.

6. THE COUNCIL OF SARDICA

i. The Council and its Date

The Council of Sardica split into separate conclaves of eastern and western bishops and failed to achieve any rapprochement between the factions. Athanasius has left an account of the council in his 'Defence against the Arians'.[19] There are also brief narratives in the works of the church historians Socrates Scholasticus, Sozomen, and Theodoret.

[19] *Defence against the Arians* 36–40; cf. *History of the Arians* 15–17.

According to Socrates, the emperors Constans and Constantius, at the request of Athanasius, called for an Ecumenical Council to be convened at Sardica (now the Bulgarian city of Sofia) to try to resolve issues between eastern and western bishops arising from disputes over the creed formulated at Nicaea. The form 'Sardica' follows the Greek spelling (so Hess 1958). Scholars sometimes refer to it as the council of Serdica, following the Latin form of the name (so Hess 2002).

The council was also to decide upon the status of Athanasius himself, who had been forced to flee Alexandria in 339 and was now residing in Italy. The eastern delegates objected to the seating of Athanasius and refused to participate. They met separately at Philippopolis (modern Plovdiv). There they confirmed their condemnation of Athanasius and also sought to depose Julius of Rome and Hosius of Córdoba, among others. The western bishops met at Sardica under the presidency of Hosius. They ordered the restoration of Athanasius, affirmed the creed of Nicaea, and adopted a number of resolutions dealing primarily with the appointment and jurisdiction of bishops.[20] The canons are extant in both Greek and Latin versions.[21]

Socrates and Sozomen date the council to the consulship of Rufinus and Eusebius, the eleventh year after the death of Constantine. Constantine died on 22 May 337.[22] The consulship of Rufinus and Eusebius was 347. Yet both the *Historia Acephala* and the Athanasian Index date the return of Athanasius to Alexandria to the 24th day of Phaophi in the consulship of Constantius IV and Constans III—21 October AD 346. Furthermore, in his Paschal letter for the year 346, written in April of 345, Athanasius refers to a decision 'of the holy synod' that Easter should be observed on 30 March. The reference must be to the Council of Sardica. According to the Athanasian Index, 'there was an agreement made at Sardica respecting Easter, and a decree was issued which was to be binding for fifty years, which the Romans and Alexandrians everywhere announced in the usual manner'.[23] The Index dates the council to the consulship of Placidus and Romulus, AD 343, and to the Alexandrian year corresponding to 342/343. Eduard Schwartz, William Telfer, and Marcel Richard dated the council to the fall of 342. Hamilton Hess, T. D. Barnes, and Richard Burgess have argued for the fall of 343.[24] The evidence as a whole favours a date some time after Easter of 343.[25]

20 Socrates 2.20; cf. Sozomen 3.11–12; Theodoret 2.6.
21 *Ecclesiae occidentalis monumenta*, i: 441–560.
22 *Consularia Constantinopolitana*, Mommsen 1892: 235.
23 Translation of Robinson 1891: 504; cf. Martin and Albert 1985: 243.
24 Schwartz 1905: 124, Telfer 1943: 238, Richard 1974: 319–27; Hess 1958: 140–4; Barnes 1978: 67–8; Burgess 1998 242–5.
25 For recent discussion of the debate, see Parvis 2006: 210–17.

ii. The 30-Year Paschal Canon of the Eastern Bishops

The author of the Athanasian Index says that the council agreed on a list of dates for Easter for the next fifty years. Apart from the comment of Athanasius in his Paschal letter for 346, we have no other references either to the agreement or to the list. We do have a copy of a thirty-year Paschal canon drafted by the eastern bishops meeting at Philippopolis. The text is in Latin, contained on folios 79v–80v of the same Veronese manuscript that includes the *Historia Acephala*, amidst a collection of material about the acts of the Council of Sardica. It was first published in 1905 by Schwartz (1905: 121–5). In an important study of the manuscript, Telfer argued that the preservation of the Paschal canon and a version of the eastern creed of Sardica to which it is appended derives from a collection of material made in Antioch about AD 420. The creed and the first sentence of the letter introducing the Paschal canon are also extant in a Syriac version.[26] The introductory text reads as follows:[27]

> About the Pascha we have also written a 30-year list, because our Saviour spent 30 years in the flesh upon the earth and his Pascha occurred in the 30th year on the 25th day of the month of March. The first year of the 30—including the computations for the Jewish observance of the Pascha—begins in the first Indiction under Constantine, in whose time the great council convened in the city of Nicaea, at which the bishops deliberated about the computation of the Pascha. The first Indiction is in the first year, and the first Indiction occurs again after fifteen years in the 16th year. †From the first year the numeration runs to the 30th, which is the first month April.† The calculations of the Jews compared with ours are as follows.

The text says the Pascha of the Saviour occurred on 25 March. It is not clear whether this 'Pascha' is a reference to the Passion on Friday, 25 March, as in the Roman tradition, or to the first Easter on Sunday, 25 March, as in the eastern church. The next to the last sentence is problematic. The Latin text reads 'from the first year'. Schwartz corrected it to 'eleventh year', on the hypothesis that in the Greek original, 11 was misread as 1. The import of the sentence is then that the 30-year list begins in the first Indiction, but the 30-year cycle begins in the eleventh year (AD 338) with the full moon of 21 March and ends in the thirtieth year (AD 367) with the full moon of 1 April. The original reading makes more sense—the numeration runs from the 1st year to the 30th. The 'first month April' might be a reference to the return of the cycle to its starting point, with a 14th day of the moon on 10 April.

There follows a list of sixteen dates for the Paschal new moon according to the Jewish reckoning and a list of thirty dates according to the Christian rules.

[26] Telfer 1943: 181–2, 193–8.

[27] My translation from Schwartz's text (1905: 122).

The first sixteen years of both lists agree on the dates for the full moon. In the Jewish list, however, the Paschal full moon is allowed to fall as early as 2 March. The latest date is 30 March. In the corresponding Christian list, the Paschal moon is dated 30 days later, in April, whenever the Jewish date is earlier than 21 March. Table 7 shows the data, incorporating Schwartz's corrections of scribal errors, which occur sometimes in the numerals, sometime in the name of the month. The corresponding dates for the 14th day of the moon according to the Anatolian cycle, as I have reconstructed it, are shown for comparison.

The simple procedure of subtracting 11 or adding 19 days to each year's date for the 14th moon will produce a 30-year cycle. Such a cycle can also be

Table 7. Paschal full moons in Sardica document, compared with Anatolian and classical dates

AD	Year	Jewish 14th	Christian 14th	Anatolian 14th	Classical 14th
328	1	11 March	10 April	10 April	10 April
329	2	30 March	30 March	30 March	30 March
330	3	19 March	18 April	18 April	18 April
331	4	8 March	7 April	7 April	7 April
332	5	27 March	27 March	27 March	27 March
333	6	16 March	15 April	15 April	15 April
334	7	5 March	4 April	4 April	4 April
335	8	24 March	24 March	24 March	24 March
336	9	13 March	12 April	12 April	12 April
337	10	2 March	1 April	1 April	1 April
338	11	21 March	21 March	21 March	21 March
339	12	10 March	9 April	9 April	9 April
340	13	29 March	29 March	29 March	29 March
341	14	18 March	17 April	17 April	17 April
342	15	7 March	6 April	6 April	5 April
343	16	26 March	26 March	26 March	25 March
344	17	—	14 April	14 April	13 April
345	18	—	3 April	2 April	2 April
346	19	—	23 March	22 March	22 March
347	20	—	11 April	10 April	10 April
348	21	—	31 March	30 March	30 March
349	22	—	19 April	18 April	18 April
350	23	—	8 April	7 April	7 April
351	24	—	28 March	27 March	27 March
352	25	—	16 April	15 April	15 April
353	26	—	5 April	4 April	4 April
354	27	—	25 March	24 March	24 March
355	28	—	13 April	12 April	12 April
356	29	—	2 April	1 April	1 April
357	30	—	22 March	21 March	21 March

based on the accumulation of 330 epacts over that period, with an advance of 11 days in the epact from one year to the next. Since epacts are counted from 1 to 30 and 330 is an even multiple of 30, no *saltus* is required to bring the fourteenth day of the moon back to its starting point after 30 years. We do not know on the basis of what precedent or parallel, if any, the eastern bishops meeting at Philippopolis devised their 30-year cycle. Elias of Nisibis reports that 'some among the ancients' composed a 30-year cycle, but that later scholars found it inadequate and replaced it with the canon of 19 years (p. 126 in Chabot's Latin translation). The agreement of the first eighteen years of the list with the Anatolian dates suggests that this new 30-year cycle is a modification of the cycle of Anatolius.

Schwartz (1905: 124) believed that the list of Jewish dates is genuine, deriving from actual observances of Passover in the Jewish community at Antioch during the fifteen or sixteen years preceding the Council of Sardica. Grumel (1958: 42–3) thought that the Jewish dates were based on a 19-year cycle. Sacha Stern (2001: 75–80, 124–33) has argued that no such cycle yet existed by the fourth century. He believes that the Jewish dates in the Sardican document derive either from actual observation of the moon or from the use of an 11-day differential in the epact from year to year, with the 14th day of the moon restricted to the Antiochian month of Dystros, equivalent to the Roman month of March.[28] Ari Belenkiy suggests that a 30-year cycle may indeed have been in use among some Jewish communities of the period.[29]

The eastern prelates included Stephen of Antioch and George of Laodicea.[30] Since Paschal calculations were apparently on the agenda, Stephen or George probably generated this cycle and brought it to the council as a rival to the calculations in effect at Rome and Alexandria. Its author moved the first year of the cycle from the new moon of 22 March in the year corresponding to 334, as in the cycle of Anatolius, to the full moon of 10 April in 328, a first indictional year. He also suppressed the *saltus* so as to make the list cyclical in the more symbolic period of thirty years, rather than nineteen.

iii. The Paschal Canon of Athanasius

As the legitimate bishop of Alexandria, to whom the council of Nicaea had delegated responsibility for Paschal rules in consultation with Rome, Athanasius would certainly have brought to Sardica a proposal for agreement on Easter based on the Alexandrian calculations deriving from Anatolius.

28 Stern 2001; on the Sardica document, see especially pp. 75–80, 124–33.

29 Belenkiy 2002: 14; Belenkiy and MacKay 2003: 10–11.

30 Theodoret 2. 6; cf. Athanasius, *Defence* 3. 36; Socrates 3. 11 says that George was not present.

Anatolius drafted a 95-year cycle beginning from AD 257/8. That list would expire in 351/352. It could therefore not serve as the basis for a list of Easter dates that was to be binding for fifty years beginning in 343 or 344. Athanasius—either himself or with the assistance of his colleagues in Alexandria with whom he remained in regular contact—would have needed to generate a new list. In order to cover the 340s, that list would have needed to overlap with the last 19 years of the Anatolian cycle.

The 95-year table of Paschal dates contained in Van der Vyver's Paris manuscript attests to the existence of just such a list. The *P* document itself is a 95-year table beginning in the year 145 since Diocletian, AD 429. Its preface, however, was written for a 95-year table that began in AD 334. It reads as follows:[31]

> Here begins the 19-year computation of Dionysius, bishop of Alexandria, bringing the rule for the Pascha back to itself and showing in nineteen years the fourteenth moon falling on the same days of the two months of March and April, but not on the same days of the week. Through a period of ninety-five years this also will return; it will show the 14th moon occurring not only the same days of March and April, but also the same days of the week. In ninety-five years there are five courses of 19. The beginning is the year 339 [*sic*!] of the coming (*adventus*) of Christ, in the fiftieth year of Diocletian. One must know, since it should be observed everywhere, how the fourteenth moon of the Pascha falls on the seven days. That is, if the fourteenth moon falls on a Sunday it is necessary to begin the seven-day fast until it becomes the 21st moon. If the fourteenth moon occurs on the Sabbath, it is necessary to complete the fast and the Pascha is Sunday the 15th. For the Sabbath is the end of the seven-day period.

The attribution of the 19-year table to Dionysius of Alexandria conflicts with the statement of Eusebius (*HE* 7. 20) that Dionysius advocated an 8-year cycle. Dionysius did, however, exercise a sixteen-year episcopate, from 248 to 264. Anatolius lived in Alexandria during that period and may well have drafted his 95-year table while Dionysius was still alive. If Dionysius adopted and promulgated it during the last few years of his tenure, then the new 19-year cycle could rightly be called 'his' cycle.

The preface was written for a 95-year table that began in the 50th year of Diocletian, AD 334. The significance of the year 339 from Christ in the text is a matter to which I will return in Ch. 18. Beginning in Diocletian 50, the original list incorporated the last 19 years of the Anatolian cycle with a 76-year continuation running through Diocletian 144, AD 428. The author of the preface, like many computists of the time, erroneously believed the 95-year period to be truly cyclical, returning the 14th day of the moon not only to the same day of the

[31] My translation based on the text published by van de Vyver 1957.

month, as with every 19-year component, but also in the 96th year to the same day of the week. Victorius of Aquitania, in the preface to his 532-year Paschal list (Krusch 1938: 18), refers to a 95-year period wrongly thought to be cyclical, as does the author of the *Chronicon Paschale* (19. 14–20).

A 95-year table covering the period from 334 to 428 fits the requirements of what Athanasius needed to prepare for the Council of Sardica. Van de Vyver believed the table represented an intermediate form of the Anatolian cycle, retaining the base-date corresponding to AD 258, but revised to reflect a change in the equinoctial date from 19 March to 21 March. No such radical revision need be supposed. As I have argued in Ch. 8, Anatolius already recognized 21 March as the equinoctial point. His cycle differed from the classical cycle only in the position of the *saltus*, producing epacts 18, 29, 10, 21, 3, where the classical cycle has 18, 30, 11, 22, 3.

The table represented by the Paris text is indeed an intermediate form of the Alexandrian cycle, but reformed on a different basis than van de Vyver supposed. It retains the base-date corresponding to AD 258 and the epact 29, as in the cycle of Anatolius, but changes the epacts for the following two years to 11 and 22, as in the classical cycle.

The motivation for those changes was the Council of Sardica and a desire on the part of Athanasius to reach accommodation with Rome without entirely abandoning the Anatolian cycle. The council met either in 342 or 343. There was already a problem with the dates for Easter in 343 and 344.

As we shall see in Ch. 11, AD 344 was one of the years for which the Roman 84-year cycle produces an anomalous result. Like the cycle of Anatolius, the Roman calculations produced a 14th day of the moon for the year corresponding to AD 342 on 6 April, followed by 26 March for 343, with 3 April appearing for 345. The year 344 had 14 April in the cycle of Anatolius, with Easter on 15 April, the 15th day of the moon. As Victorius of Aquitania informs us (Krusch 1937: 19), Roman rules did not permit the observance of Easter before the 16th day of the moon. The Romans agreed with the Anatolian date for Easter on 15 April in 344, but counted it as the 16th day of the moon.[32]

Athanasius brought the Alexandrian calculation into agreement with the Roman by moving the effective date of the *saltus* in the Anatolian cycle, so that the 14th day of the moon on 6 April would be followed in the next two years by dates on 25 March and 13 April. By moving the 14th day of the moon from 14 April to 13 April for the year 344, Athanasius calculated the moon of Easter Sunday as 16, thus conforming to the Roman rule.

For the year 343, the Anatolian cycle produced a 14th day of the moon on Saturday, 26 March. By the Alexandrian rules, Easter would be observed on 27

[32] So the Ambrosian Easter Table, Krusch 1880: 238.

March, the 15th day of the moon. The Roman calculation also designated 26 March as the 14th day of the moon in that year. Because the Romans would not observe the festival before the 16th day of the moon, Easter was to be postponed until 3 April. Athanasius moved the 14th day of the moon for that year to 25 March, thus producing a 16th day on 27 March and legitimizing that date under the Roman rules.

Socrates (*HE* 2. 20. 6) says that 18 months elapsed between the time the council was summoned and the time it actually met. If the council did not meet until after Easter of 343, Athanasius' proposal for that year was already moot. The dates in the *Chronograph of 354* and the Athanasian Index show that the Alexandrian Easter in 343 was on 27 March, Roman Easter on 3 April. For the year 344, the difference in the calculated date for moon 14 did not affect the date of Easter. Both Rome and Alexandria observed Easter on 15 April. By changing the epacts for the years 343 and 344, however, Athanasius not only produced agreement on the moon of Easter for the year 344, but also incorporated into the Alexandrian cycle dates for the 14th day of the moon that had a privileged position in the Roman calculations. The Roman 84-year cycle began with a 14th day of the moon on 13 April and ended with 25 March.

The evidence is not compelling, but a change in the Alexandrian cycle in connection with the Council of Sardica is the best explanation for the sequence of epacts that we find both in the Athanasian Index and in Van der Vyver's 95-year list of Easters. It was the 95-year cycle of Anatolius as modified by Athanasius that the author of the Athanasian Index used to find the epacts for each year of Athanasius' patriarchate. The cycle of Athanasius was also the 95-year cycle, beginning in the 50th year of Diocletian, for which the Paris list provided a continuation. It was Athanasius who introduced into the Easter tables the numbering of the years from the first year of Diocletian, but that year did not yet correspond to the first year of a 19-year cycle. As the inscription honouring the last sacred bull of Armant in the 57th year of Diocletian (AD 340) shows, such numbering was already in use in Egypt by the time of the Council of Sardica. In a Paschal list intended for use during the next 50 years, only some such numbering system would serve the purpose. The eastern bishops numbered their list from the first year of an indictional cycle. Athanasius used the years of Diocletian.

The church at Milan adopted a 19-year cycle of the Athanasian type. As noted above, in his letter on the date for Easter in 387, Ambrose commends the 19-year cycle as having been authorized at Nicaea and perfected in Egypt. He cites precedents for postponement of Easter when the 14th day of the moon falls on a Sunday by reference to numbered years of Diocletian from as early as 76 Diocletian = 359/60.

10

The Classical Alexandrian Cycle

1. THE 100-YEAR PASCHAL LIST OF THEOPHILUS

In his letter to Petronius, Dionysius Exiguus attributes the development of the 19-year cycle after the Council of Nicaea to Athanasius, Theophilus, and Cyril (Krusch 1938: 63). He says that Theophilus drafted tables fixing the date of Easter for a period of one hundred years, which he dedicated to the emperor Theodosius I. Theophilus must have completed this work sometime between 385, when he became bishop of Alexandria, and January of 395, when Theodosius died (Socrates, *HE* 5. 12, 5. 25).

No copy of that 100-year list has survived. There are references to it in the correspondence of Leo of Rome concerning the problem of the Paschal celebration for the year 455.

In his letter asking the emperor Marcian to intervene in the matter, Leo says that Theophilus composed a list of dates for Easter for a period of 100 years and that it began from the first consulship of the emperor Theodosius, AD 380. Leo cites data for three consecutive years beginning with the 74th year (AD 453), with Easter dates on 12 April, 4 April, and 24 April, to the last of which he objects as exceeding the Roman limit of 21 April (Krusch 1880: 257–61).

Marcian referred the question to Proterius of Alexandria, who then responded to Leo. Dionysius Exiguus included a Latin translation of this letter among the material that he sent to Petronius (Krusch 1880: 269–78). Whereas Leo had cited Theophilus in numbered years from the first consulship of Theodosius, Proterius cites the list as numbered from the first year of Diocletian.

Proterius designates the forthcoming year as the 171st since Diocletian, AD 454/5, an eighth indictional year, when the 14th day of the moon will fall on Sunday, 17 April. It is necessary therefore, in accordance with the rules of Theophilus and long-standing precedent, he says, to defer Easter to the following Sunday, 24 April. Proterius cites precedents from as early as the 89th year of Diocletian (AD 372/3) and continues with examples from the years 93 (AD 376/7), 103 (AD 386/7), and 160 (AD 443/4). The last example was not a case of a Sunday postponement, but an instance when the 14th day of the moon fell on Tuesday, 18 April, so that Easter on Sunday, 23 April, exceeded the usual Roman limit. Since the first two examples date from several years before the beginning of the list of Theophilus, Proterius must have consulted the Paschal list of Athanasius as well.

Although the hundred-year list of Theophilus has not survived, we do have Latin translations of the dedicatory letter and of a prefatory tract (Krusch 1880: 220–6). The author of the *Chronicon Paschale* (28–31) preserved a substantial fragment of the Greek text of the preface.

In the letter addressed to Theodosius, Theophilus says that he has composed a table of dates for the observance of the Paschal festival for a period of 100 years, beginning from the first consulship of Theodosius. He has done so, Theophilus explains, 'because it is fit and proper that after your time, whenever anyone in the Church of Alexandria looks for the absolutely certain date of Easter, he should always meet with your name; thus your name will for ever be preserved among all men'.

In the preface, Theophilus explains clearly and comprehensively for the first time the rules for determining the date of the Paschal festival. Moses commanded that the Passover should be observed on the 14th day of the first month, calling that month first in which the new fruits sprout. He specifies the 14th day, so that in imitation of the light of the full moon men should cast off the darkness of sin and shine with blossoms of virtue. The 14th day may not come before the beginning of spring, which is the 12th day before the Kalends of April, 25 Phamenoth in the Egyptian calendar, 21 Dystros (March) in the Macedonian calendar of Antioch. If the 14th day of the moon falls on a Sunday, the observance must be postponed for one week. There are two reasons for this rule, Theophilus says. First, it is on Saturday that the Paschal fast is broken, and it not lawful to break the fast before the 14th day of the moon. Second, it is not proper to fast on a Sunday, as the Manicheans do. Theophilus explains that it was on the fifth day of the week and the fourteenth day of the moon that the Saviour was betrayed, the 15th day when he was crucified, and it was on the Lord's day, the 17th day of the moon, when he rose again.

These are the readings of the Latin text. The author of the *Chronicon Paschale* altered the sequence to 13, 14, and 16, to bring the text into conformity with his own doctrine (see Ch. 13). In the letter to Leo, Proterius confirms that Theophilus gave the sequence as 14, 15, and 17 (Krusch 1880: 271). This became the orthodox doctrine in western Christianity—a teaching, Bede says (*DTR* 48), that 'no Catholic can doubt'.

If the 14th day of the moon falls on a Saturday or earlier in the week, Theophilus continues, it is appropriate to break the fast. Otherwise, the observance must be postponed a week. Addressing the emperor, Theophilus concludes the prologue as follows. 'With these admonitions thus prefaced, I subjoin the calculations: from the first consulship of your God-loving name, Emperor, for one hundred years, the date both of the 14th day of the moon and of the Sundays for Easter.'

The first consulship of Theodosius corresponds to AD 380. Thus the list of Theophilus began exactly 95 years—five cycles of 19 years each—after the first year of Diocletian. Denis Petau therefore assumed that the first year of the list of Theophilus was also the first year of a 19-year cycle. Other scholars have agreed, adducing the list of Theophilus as evidence that the cycle of Anatolius had been reformed early in the fourth century to make its first year correspond to the first year of Diocletian.[1]

1 have argued in the previous chapters that no such reform of the Anatolian cycle had taken place by the time of Theophilus and that Athanasius still used a cycle with a base-date corresponding to AD 257/8. That the first consulship of Theodosius was exactly 95 years after the first year of Diocletian may be no more than a coincidence. In particular, the fact that Theophilus composed a list covering 100 years, rather than 95, raises doubts as to whether the first year of the list was also the first year of a 19-year cycle.

C. W. Jones (1943: 62) suggested that Theophilus chose the round, but arbitrary number of 100 years, because he knew that the 95-year period was not truly cyclic. It is as likely, however, that Theophilus drafted a table containing an even 100 years, because he knew its first year was not the first year of a cycle. He wanted to honour Theodosius by numbering the years from his first consulship (AD 380). As we shall see, Cyril followed his example and composed a Paschal list of 110 years, beginning from the first consulship of Theodosius II, AD 403. In his dedicatory letter, Cyril explicitly states that the first year of the list was not also the first year of a cycle. There is therefore no reason to insist that the 100-year table of Theophilus must have begun in the first year of a cycle.

In the absence of the list, we have no way of knowing whether the sequence of epacts in the Paschal list of Theophilus agreed with the original cycle of Anatolius, with the Athanasian Index, or with the classical cycle as we know it from Dionysius Exiguus. Three of the Paschal letters of Theophilus are extant in a Latin translation by St Jerome (*PL* 22. 790, 812, 828). From them we learn that Theophilus prescribed Easter for 19 Pharmouthi (14 April), 11 Pharmouthi (6 April), and 22 Pharmouthi (17 April). The years correspond to AD 401, 402, and 404. The date of Sunday, 14 April shows that Theophilus had epact 22 for that year, in agreement with the classical cycle—not epact 21 as in

[1] Petau 1630, reprinted *PG* 19. 1406; Rühl 1897: 116; Ginzel 1906–14: iii. 233; Grumel 1958: 37.

the Anatolian cycle, which produces a 14th day of the moon on 14 April and would require a Sunday postponement in that year.

The list of Sunday postponements that Proterius cites in his letter to Leo is unfortunately not exhaustive. He gives no examples for the period after 387, although the epacts in the classical cycle would have produced a coincidence between Sunday and the fourteenth day of the moon in the years corresponding to 397, 400, 403, 404, 407, 424, 427, 428, and 431.

For the earlier period, Proterius cites as examples the years 373, 377, and 387. It is interesting that he does not cite the years corresponding to 380 and 383. The year 383, with epact 3 in both the classical and Anatolian cycles and a 14th day of the moon on Sunday 2 April, is not critical to the question. For 380, however, the epact of 30 = 0 as in the classical cycle produces a 14th day of the moon on Sunday, 5 April, requiring a postponement of Easter to 12 April. It would be surprising for Proterius not to have cited the year numbered as 1 in the list of Theophilus, if that year had been an example of a Sunday postponement. If Theophilus used the epact 29, as in the Athanasian Index, then the 14th day of the moon would have fallen on Monday, 6 April, so that Easter Sunday on the 12th would not have been an example of a Sunday postponement.

2. THE 110-YEAR PASCHAL LIST OF CYRIL

The earliest unambiguous evidence for an Alexandrian cycle recalibrated to make its first year correspond to the first year of Diocletian is the 110-year Paschal list that Cyril, the nephew and episcopal successor of Theophilus, dedicated to the emperor Theodosius II. Cyril became bishop upon his uncle's death in 412 and served for 32 years (see Ch. 4).

Dionysius Exiguus attributed to Cyril the 95-year table beginning in the year 153 from Diocletian (AD 437) that he used as the model for his own 95-year continuation. I have argued in Ch. 4 that the attribution of that list to Cyril is not, as Krusch and Schwartz maintained, a fiction, but that it was the very list, divided into ogdoads and hendecads, that Paschasinus of Lilybaeum mentioned in his letter to Leo about the date for the forthcoming Easter of AD 444. Cyril was still alive at the time of that dispute, and it is likely that he sent this 95-year list to Leo along with his letter on the subject.

Whatever the provenance of the 95-year list, Cyril had already drafted a 110-year list beginning in the year corresponding to AD 403. F. C. Conybeare (1907: 215–21) published an English translation of a letter of Cyril addressed to the emperor Theodosius II, which had been discovered in an Armenian text. In the letter, Cyril paraphrases the prologue of Theophilus and states that he has himself composed a table covering 110 years, beginning from the first consulship of Theodosius II, AD 403. In Conybeare's translation, the end of the letter reads as follows:

> Accordingly, your first glorious consulate having ended in the 119th year from Diocletian, from that (year) having taken it, we have compiled a table for the subsequent 109 years' period . . . But since it was useful to write out complete the 19 years' cycle (or revolution) with continuity, we have been obliged, in your first glorious consulate, which was in the 119th year of Diocletian, to anticipate by four years. For these years must not be reckoned with the number of those 110 years which follow them, but they are only written. Wherefore, as I have said, the 19 years' cycle appears in full in the canon, for every canon involves a cycle of 19 years.

As Jones (1943: 38) rightly concluded, what Cyril actually composed was six cycles beginning in the year corresponding to AD 399 and ending in 512. The first 19-year cycle began four years before the first consulship of Theodosius—that is, in the year 115 of Diocletian. Cyril apparently did not number the first four years at all, but began the numbering with 1 in the fifth year. There was perhaps a parallel column numbering the years from Diocletian, beginning with 119.

Socrates Scholasticus (*HE* 6. 6, 7. 1) says that Theodosius II was born on 10 April, in the year corresponding to AD 401. He was less than two years old when the year of his 'first glorious consulate' began and seven years old when he succeeded his father Arcadius as emperor in the east on 1 May of 408. Imperial power was effectively in the hands of the prefect Anthemius.

After the death of Anthemius, probably in 414, Theodosius' older sister Pulcheria took the title of Augusta and governed in her brother's name.[2] Theodosius became sole emperor upon the death of his uncle Honorius in August of 423 (Socrates 7. 22–3). Jones (1943: 38) suggested that it was in the 420s that Cyril dedicated his Paschal tables to Theodosius, after a victory against the Persians and a successful intervention at Rome had made the name of Theodosius the Younger glorious indeed.

The Alexandrian cycle took its definitive form in the table of Cyril. The Ethiopic tables, which exhibit the same epacts as the 95-year table that Dionysius Exiguus labels as 'Cyril's', take as their base-date not the year corresponding to 380, the first year of the table of Theophilus, but 399, the first year of Cyril's first 19-year cycle (Neugebauer 1979*a*: 31, 124). That year corresponds cyclically to the first year of Diocletian, and Cyril's letter to Theodosius is the earliest evidence for a 19-year cycle calibrated in that way.

[2] Sozomen 9. 1; Theophanes, p. 81 de Boor; Marcellinus Comes, Mommsen 1894: 71.

3. THE PREFACE OF CYRIL

The extant preface of Cyril is a Latin text that circulated under the title 'Prologue of Saint Cyril, bishop of Alexandria, on the calculation of Pascha'. Denis Petau first published the text (1703: ii, appendix) and Bruno Krusch published a critical text from three manuscripts (1880: 337–43). The author refers to Theophilus as his authority. He repeats the doctrine that Christ ate a Passover meal and was betrayed on the fifth day of the week, the 14th day of the moon. He says that Theophilus established a Paschal cycle of 418 years and calculated the dates for a hundred years beginning from the first consulship of Theodosius. A number of other cycles have been proposed in the meantime, he says, including a cycle of 84 years, all of which are riddled with errors. Therefore he has decided to publish a 95-year abbreviation of that 418-year list. One of the problems with other cycles is that their authors add the extra day of the moon in the 14th year or the 16th year, while Theophilus correctly did so at the end of the 19th year. The author explicitly calls this extra day the *saltus*. The use of this word alone shows that the text is the work of a Latin author, not a translation from Cyril's Greek. Greek authors do not refer to this extra increment of the epact as a 'leap' of the moon. The author discusses the 30th day of the moon as the day when the moon is in the middle between waxing and waning and is not visible. He says that this 30th day is the first point for calculations. That phrase suggests that the author used a table that began with epact 30.

A table that began with epact 30 = 0 and had its *saltus* at the end of the 19th year is the Alexandrian cycle in its classical form, identical to the exemplar that Dionysius Exiguus had before him. The text of the preface in its present form is, however, confused and confusing. In particular, not only is it erroneous to attribute a 418-year cycle to Theophilus, such an interval makes no sense at all in the context. The number 418 is a multiple of 19, but twenty-two 19-year cycles do not constitute a Paschal period. For that reason, among others, Krusch argued that the text could not possibly be the authentic work of Cyril. He suggested that the 418 years originated as a date for the first consulship of Theodosius, based on the Spanish era, whose epoch corresponded to 38 BC.[3]

Jones discovered another version of this text in a manuscript at Chartres and published it in his 1943 edition of Bede's chronological works. It does not include the problematic portion referring to a 418-year cycle. It does

[3] Krusch 1880: 89–98; on the Spanish era, see Ginzel 1906–14: iii. 175–7.

have a subscription, which the other version lacks. The text is problematic. Unfortunately, according to Grumel (1958: 39 n. 5), the manuscript that Jones saw in the 1930s was among those burned when a bomb destroyed the building in which the library was housed on 26 May 1944. Jones's text and translation are as follows (1943: 43):

anno cccc° et x° [xx] consolatus auferri [asterii] et protogenis circulis ipse ad caput redit, id est a pascha quod salvator noster cum discipulis suis celebravit, qm. [quem] ut arbitror competens [completum] est. reddita ratio iam l,xlv annorum paschae dies quibus kal., dis. [nonis], vel idibus et cota luna occurat [-averunt], ex ordine cauculemus.

In the year 420, the consulate of Asterius and Protogenes, the cycle returned to its start, that is to the Pascha which our Lord observed with His disciples, which, I believe, was complete. We shall calculate in order when the table has completed fifty years, for the Easters have occurred for forty-five years according to Kalends, Nones, and Ides, and according to the age of the moon.

The consulship of Asterius and Protogenes corresponds to AD 449. In stating that the cycle returns to its head in that year after 420 years, the author is faithful both to the Latin tradition that Jesus suffered on Friday, 25 March, in the 15th year of Tiberius (AD 29) and to the teaching of Theophilus that the Passion occurred on the 15th day of the moon. In AD 449, 25 March was a Friday. The Alexandrian cycle produces a 14th day of the moon in that year on 24 March. The interval of 420 years happens to be five periods of 84 years. Jones understood the interval as based on the 84-year cycle that was in use at Rome in this period. Such an inference is not warranted by the text. The author simply states that the year AD 449 happens to recapitulate the data of the Passion. The Alexandrian cycle has the 14th day of the moon on 24 March in that year, but the 84-year cycle produces 22 March (see Ch. 11).

Jones (1943: 44) argued that this text was written in AD 482—45 years after the start of the tables to which Paschasinus refers as beginning in 437. Thus the Chartres preface was composed to introduce into Africa in 482 the same 95-year table adapted for Latin use that Dionysius had before him in 525. The other version of the Cyrillan preface is, in Jones's view, a later adaptation of the text, written perhaps in Spain in the latter part of the sixth century. August Strobel (1977: 253–69), however, thought the Chartres text to be the later of the two.

Grumel (1958: 39–40) interpreted the numbers in the subscription differently. In his opinion, the author was writing in or shortly after the year 449 and had before him a copy of Cyril's 114-year Paschal table beginning in AD 399. The phrase *reddita iam ratio l* means that fifty years in the cycle have already passed. The phrase *xlv annorum paschae dies . . . calculemus* means that the author has decided to translate into the Roman calendar only the 45 years that still remain to complete the traditional period of 95 years.

Leofranc Holford-Strevens has suggested a different and more persausive reconstruction of the text:[4]

anno cccc^{o} et x<x>^{o}, consolatu{s} Asterii [auferri *cod.*] et Protogenis circulus [-lis *cod.*] ipse ad caput redit, id est a<d> pascha quod salvator noster cum discipulis suis celebravit. quoniam ut arbitror competens est reddita ratio iam l, xlv annorum, paschae dies quibus kalendis, nonis [dis. *cod.*], vel idibus et cota luna occur<r>at, ex ordine cauculemus.

In the year 420, in the consulate of Asterius and Protogenes, the said circle returns to its beginning, that is to the Pasch that our Saviour celebrated with his disciples. Since as I think an adequate account has now been given of the 95 years, let us calculate on what Kalends, Nones, or Ides, and in what age of the moon the day of the Pasch occurs.

In this reconstruction, the numerals *l, xlv* are either a corruption of *lxxxxv* or should be understood as *l et xlv*. Grumel's hypothesis that the text was meant to accompany a 95-year table that began in AD 399, 50 years before the consulship of Asterius and Protogenes, is unconvincing. There is no other trace of a Latin version of Cyril's 110-year list with a base-date in 399. Jones was right. The text is a preface to the 95-year list beginning in 437 to which Paschasinus referred in his letter to Leo on the date for Easter in 444 (Krusch 1880: 248) and which Dionysius Exiguus knew as Cyril's.

The author of this preface was not Cyril. His arguments in favour of a calculation beginning with epact 30 are based on the 95-year cycle attributed to Cyril that began in AD 437. That cycle had its *saltus* at the end of the 19th year. The text may well have been accompanied by a copy of the prologue of Theophilus, circulating already without the 100-year list itself. By attributing a cycle with its *saltus* at the end of the 19th year also to Theophilus, the author gave his own views a higher authority. The statement should not be taken as evidence that Theophilus had already recalibrated the Alexandrian cycle so as to yield that result.

The author of the later version was not a Spaniard using a local era corresponding to 38 BC. He was confused by the reference to a 420-year period in the subscription. He therefore omitted the subscription, changed the number from 420 to 418—a multiple of 19—and assumed that the 95-year table was an abridgment of that longer list.

[4] Holford-Strevens in comments on a previous draft of this chapter.

4. THE 532-YEAR *PASCHOUALION* OF ANNIANUS

Cyril does not say in his dedicatory letter why he decided to compose a new list of Paschal calculations, with a starting point only 23 years later than the table of Theophilus. One reason was certainly a desire to honour Theodosius II in the same way that his uncle had honoured Theodosius' grandfather. His statement that the first consulship of Theodosius II was the fifth year of a cycle is the earliest direct evidence for an Alexandrian 19-year cycle organized such that its first year corresponded to the first year of Diocletian. One reason for a new list may therefore have been Cyril's decision to adopt such a cycle and make it the official Paschal calendar of the Alexandrian church.

Neither Proterius nor Leo, in their correspondence about the disputed date for Easter in 455, cites the 110-year list of Cyril or its 95-year Latin adaptation. Both cite only from the 100-year list of Theophilus. Cyril was a controversial figure, only recently deceased. The 100-year list of Theophilus was still in course. His name lent higher authority and greater antiquity to the Alexandrian cycle.

The person responsible for the new form of the cycle was Annianus. We know of Annianus and his contemporary Panodorus almost exclusively through the chronicle of George Syncellus. Syncellus adopted the cosmic chronology of Annianus. Citing Annianus, he says (35.20–5) that the world was created on Sunday, the 29th day of Phamenoth, 25 March, that it was on 25 March at the beginning of the year 5501 that Christ became Incarnate of the Virgin Mary, and that it was also on Sunday, 25 March, at the beginning of the year 5534 that Christ rose from the dead. He designates the year 5501 (381. 5–33) as the consulship of Sulpicius Camerinus and Gaius Pompeius and the 181st year of the eleventh 532-year period since creation.

The consulship of Camerinus and Pompeius corresponds to AD 9. The year 5501 began on 25 March of that year, and the year 5534 therefore began on 25 March of AD 42, in which year that date was indeed a Sunday. By this chronology, 25 March of AD 285, the first year of Diocletian, was the cosmic year 5777, which would be the first year of a 19-year cycle as counted from the creation on 25 March of the year corresponding to 5492 BC. This conclusion is consistent with the equation between AD 9 and the year 181 of a 532-year period. If AD 9 was the year 181, then AD 285 was the year 457; and the 532-year period ended in AD 359/60. A new cycle would begin in 360/1, the 77th year of Diocletian. That year is designated in the Ethiopic Easter tables as 'the year of Grace' (Neugebauer 1979*a*: 116–20).

Syncellus says (35. 7) that Annianus and Panodorus were contemporaries who lived in the time of Theophilus. He says in one place (35. 26–7) that

Annianus wrote a *Paschoualion* of 532 years, with 'scholastic observations', in another (382. 1–2) that he composed a cycle consisting of eleven *Paschoualia* of 532 years each, with 'sharp scholia'.

As far as we know, it was Annianus who first put the 532-year period into the service of Paschal calculations. One of the books that Photius read included a 532-year cycle beginning in the first year of Diocletian and attributed to one Metrodorus. Photius says (*Bibl. cod.* 115) that he could not ascertain who this Metrodorus was. Antoine Pagi (1689: vi) identified him with the philosopher of that name whom Jerome (p. 232 Helm) dates to AD 330. Of that Metrodorus, George Cedrenus writes that he visited India during the reign of Constantine to study philosophy with the Brahmins and while there introduced the Indians to watermills and baths.[5] This Metrodorus was sufficiently well known that Photius could not have been ignorant of him. The 532-year Paschal table attributed to Metrodorus was probably a production of the sixth or early seventh century, one among the many such tables to which the author of the *Chronicon Paschale* refers (20.19–21.5).

Syncellus preserves only one direct quotation from Annianus (36. 22–9). In it Annianus criticizes Eusebius for counting the 20th year of Constantine as the cosmic year 5526 instead of 5816. Annianus proves 5816 to be the correct year by directing the reader to the perpetual table of 532 years. The number 5816 divided by 532 yields 10 with a remainder of 496. At the year 496 of the Paschal table, Annianus says, one will find that the 14th moon occurs on the 29th day of Phamenoth, which is 25 March, and that Easter Sunday is the 3rd day of Pharmouthi, 29 March. If, however, one takes the remainder from Eusebius' number of 5526 and looks it up in the Paschal table, the lunar data will not be correct for the 20th year of Constantine.

The year 5816 in Annianus' chronology corresponds to AD 324. In the Alexandrian calculation as we have it from Dionysius Exiguus the year AD 324 was the second year of a cycle and does indeed have a 14th moon on 25 March. The number 496 is divisible by 19 with a remainder of 2. The year 496 of a 532-year period is therefore also the second year of a 19-year cycle. The *Paschoualion* of Annianus represents the classical cycle with its new base-date and a new sequence of epacts. This conclusion is consistent with the statement of Syncellus (388. 22–389. 10) that the Passion took place on 23 March at the end of the year 5533. Syncellus says that was the 213th year of the eleventh 532-year period. The number 213 is divisible by 19 with a remainder of 5. Therefore the year of the Passion is the fifth year of a cycle, and it is in the fifth year of the classical cycle that the 14th day of the moon falls on 22 March.

[5] Cedrenus i. 516. 16–23; cf. Rufinus, *HE* 10. 9, Ammianus Marcellinus 4. 24.

Annianus generated a perpetual Paschal table of 532 years, apparently numbered 1–532. One found the dates for the Paschal moon and for Easter Sunday for any given year by dividing the number of the year in Annianus' cosmic count by 532 and finding the remainder. One then looked up the number expressed by the remainder in the 532-year table to find the lunar data.

Syncellus says that Annianus chronicled eleven 532-year periods. He could therefore have finished this work at any time after AD 360. He also says, however, that Annianus and Panodorus were contemporaries and that they 'flourished' during the time of Theophilus. At least one of them finished his work either shortly before the death of Theophilus in 412 or not long thereafter. Syncellus quotes a passage that he attributes ambiguously (34. 24–5) to 'that most reverend monk the writer Annianus and Panodorus his contemporary monk and historian'. In the passage the writer says (33. 18–27) that he will recount the chronology for 5816 years from Adam to the 20th year of Constantine and then continue to the time of Theophilus, the 22nd archbishop of Alexandria and Egypt, for a total of 5904 years.

If the year 5501 corresponds to AD 9 and 5816 to AD 324, then the year 5904 corresponds to AD 412. According to Socrates (7.7), Theophilus died on 15 October of that year. Since the writer does not refer to him as 'of blessed memory', the passage may have been written earlier that year. In any case, the completion of this work ending in the cosmic year 5904 was well after Theophilus had composed his 100-year list dedicated to Theodosius I, who died in January of 395.

Denis Petau argued that Annianus established what has come to be known as 'the Alexandrian era of creation' on 25 March of the year corresponding to 5492 BC as a variant of the cosmic era of Panodorus. Panodorus in turn had calculated the year 1 as beginning on the first day of the Alexandrian month of Thoth, 29 August in the Roman calendar, in the year corresponding to 5493 BC. Panodorus based this calculation on the era of Diocletian.[6] Most scholars have accepted the argument in one form or another (see Ch. 16).

Petau's reasoning can be summarized as follows. Because the Alexandrian Paschal cycle in its definitive form began with the first year of Diocletian, the year 1 of the world should be the beginning of a cycle and therefore correspond cyclically with Diocletian year 1. Julius Africanus had already popularized the idea that Christ was born in approximately the year 5500 of the world. Eusebius stated in his *Ecclesiastical History* (7. 32, 8. 2) that 305 years had elapsed from the birth of Christ to the time of the Great Persecution in the 19th year of Diocletian. Panodorus therefore knew that the 19th year of Diocletian should be approximately 5805 and the first year of Diocletian

[6] Petau 1630, reprinted *PG* 19: 1405–8; so also Ideler 1825–6: ii. 447.

about 5787. The first consulate of Theodosius would be about 5882. Panodorus subtracted ten from this number in order to make the first consulate of Theodosius correspond to 5872, which is 1 more than a multiple of 19. The year 1 of the world was accordingly the first year of a cycle, and the year 5872 was the first year of the 310th cycle. In this scheme, the first year of Diocletian corresponds to 5777 and AD 284/5. The year 1 therefore began on 1 Thoth of the year corresponding to 5493 BC. According to Petau, Annianus accepted this calculation, but specified that the date of creation was Sunday, 25 March of the year corresponding to 5492 BC and that the year 1 began at that time.

As I shall argue further in Ch. 16, this understanding of the relationship between Annianus and Panodorus must be reversed. It was Annianus who calculated the Alexandrian era of creation on 25 March of the year corresponding to 5492 BC. Panodorus modified it by making the year 1 begin proleptically on 1 Thoth of 5493 BC.

What is most remarkable about the cosmic era of Annianus is not that its year 1 corresponds cyclically to the first consulate of Theodosius and the first year of Diocletian, but that its year 5533/4 produces precisely the lunar data for the year of the Passion that Theophilus had established on the basis of the synoptic Gospels. The year 5534 in the chronology of Annianus began on 25 March AD 42. That year corresponds to the fifth of an Alexandrian cycle, with epact 14 and a 14th day of the moon on 22 March. That date was a Thursday in AD 42. Therefore, choosing that year as his date for the Passion, Annianus met the criteria of Theophilus that Christ was betrayed on Thursday, the 14th day of the moon, crucified on the 15th day of the moon, and rose from the dead on Sunday, 25 March, the 17th day of the moon.

It is too much of a coincidence that a cosmic era independently calculated on the basis of the era of Diocletian should produce in the year 5533/4—when Jesus was 33 years old—a 15th day of the moon on Friday, 23 March. Annianus took as his starting point not the first year of Diocletian, but the year corresponding to AD 42 as the date of the Passion.

Annianus had on his desk the hundred-year Paschal table of Theophilus. In the prologue, Theophilus had insisted that Easter should not be observed before the 15th day of the moon, because it was on the 15th day of the moon that Christ was crucified. The accepted date for the Passion in the Alexandrian church at this time was that of Julius Africanus. Eusebius quotes a passage in which Africanus states that the year of the Passion was in the 16th year of Tiberius and the second year of the 202nd Olympiad, AD 30/1. In that year, 25 March was a Sunday. According to the chronology of Africanus, this was also the year 5531 or 5532 since creation.[7]

[7] Eusebius, *DE* 8. 2. 53; Syncellus 393. 29; see Ch. 17 and Mosshammer 2006.

Annianus decided to find out whether the date in Olympiad 202.2 was astronomically possible. He discovered the 532-year Paschal period by multiplying the 19-year lunar cycle by the 28-year solar cycle. At intervals of 532 years, both the calendar date and the weekday of the Paschal moon would repeat. He extended the Paschal list of Theophilus forward and found that 532 years after Olympiad 202.2, in the second year of the 335th Olympiad, the 279th year of Diocletian, AD 563, the 14th day of the moon would fall on Saturday, 24 March. Annianus concluded that Africanus must therefore have been at least partially in error, because these data contradicted not only the doctrine of Theophilus but also the New Testament evidence on which it was based. He found that eleven years later in the list 25 March would again be a Sunday, in a year when the 14th day of the moon would fall on Thursday, 22 March. Annianus decided that must have been the year of the Passion. It should also have been approximately the year 5533, because the Gospel of John (2: 13, 6: 4, 11: 55) says that Jesus observed three Passover seasons with his disciples.

Annianus decided to recalculate the era of creation accordingly, moving it from Sunday, 22 March, in the year corresponding to 5501 BC, to Sunday, 25 March, 5492 BC. Annianus also decided that the 532-year Paschal period should begin at the creation. The result was a 19-year cycle whose first year coincided with the first year of Diocletian.

The fact that there is an interval of 95 years between the first year of Diocletian and the first consulate of Theodosius is a coincidence. The dates are historically correct. So also, the coincidence between the first year of Diocletian and the first year of the world is just that—a coincidence, not the rationale for the whole system.

In years that corresponded cyclically to the first year of Diocletian, the Alexandrian cycle of Anatolius, Athanasius, and Theophilus had epact 29, with a fourteenth day of the moon on 6 April. Annianus decided to change it to epact 30 = 0. With epact 0 on 26 Phamenoth, the cycle would begin with the new moon at conjunction on the last day of the previous Alexandrian civil year. Annianus also moved the *saltus* to the end of the cycle, so that the epact advanced from 18 to 30. The result was a new cycle that differed from the cycle of Anatolius in the date of the Passover moon in only three of its years and from the cycle of Athanasius and (presumably) Theophilus in only one year.

It was this recalibration of the Alexandrian cycle that prompted Cyril to draft a new Paschal list beginning in AD 399, even though the list of Theophilus still had more than fifty years to run. Shortly thereafter, he composed—or caused to be composed—a Latin version of a 95-year cycle beginning in AD 437. Paschasinus, in his letter to Leo commenting on the Easter date for AD 444, referred to this new cycle, a copy of which Leo had probably sent him. Leo continued, however, as late as 454, to cite from the table of Theophilus. Proterius in responding therefore defended the cycle of Theophilus, without referring to the cycle of Cyril.

The cycle of Cyril and with it the Alexandrian era of Annianus soon replaced the earlier calculations. The 532-year tables of the Ethiopian church, with a base-date in AD 399 and a cosmic era corresponding to 5493/2 BC, show that Cyril's cycle became and long remained the Alexandrian standard. By the time of the emperor Justinian in the 550s, the reformed Alexandrian cycle had also become the Byzantine standard. St Maximus the Confessor (*PG* 19. 1234), writing about 640, referred both to this cycle and to the Alexandrian era of Annianus as the 'ecclesiastical tradition'. The western church adopted the cycle of Cyril through the continuation provided by Dionysius Exiguus. In the form that Dionysius knew it, the cycle of Cyril and its accompanying prefatory material apparently did not include the cosmic chronology of Annianus, with its equation between the first year of Diocletian and the year 276 from the Incarnation. Dionysius used the equation 1 Diocletian = AD 285.

11

Paschal Calculations at Rome

In his letter to Leo on the date for Easter in the year corresponding to AD 444, Paschasinus of Lilybaeum states (Krusch 1880: 248) that the year in question will be the 63rd year of the Roman cycle (*Romana supputatio*) that began in the consulship of Antonius and Syagrius, AD 382. In the 63rd year, he says, the Roman calculation would place Easter Sunday either on 26 March or on 23 April. Paschasinus urges Leo to accept the latter date on the grounds that the year must be embolismic. Leo himself refers to what must be this same *Romana supputatio* in his letter to Paschasinus on the date for AD 455, when he says (Krusch 1880: 257) that 'in our Paschal cycles' the date prescribed for Easter is 17 April, rather than 24 April, as in the list of Theophilus.

1. THE ROMAN 84-YEAR CYCLE

The Roman cycles to which Paschasinus and Leo refer were based on an 84-year Paschal period, as we learn from several sources. Leo's archdeacon Hilarus charged Victorius of Aquitania with the task of investigating and reconciling the various methods of Paschal calculation then in use. Victorius' work is discussed at the end of this chapter. In his preface (Krusch 1938: 18), Victorius refers to a cycle of 84 years believed to be periodic, as well as to the Alexandrian cycle of 95 years and the Hippolytan period of 112 years. The author of the preface of Cyril (Krusch 1880: 337), writing shortly after AD 449, defends the 19-year cycle against the use of an 84-year cycle.

The sources also refer to an 84-year cycle used in the British islands. St Bede says (*HE* 2. 2) that the Britons in the time of Augustine of Canterbury (*c.*600) followed an 84-year cycle. St Columban of Ireland, writing to a synod convoked against him about AD 600, defends the 84-year cycle of his native land (Letter 2, p. 18 Walker). St Aldhelm, Abbot of Malmesbury and bishop of Sherborne, in a letter to King Geraint of Cornwall written in 672, attributes an 84-year cycle to Sulpicius Severus (Letter 4; p. 483 Ehwald). Severus was a Christian chronicler and historian from Gaul, who flourished about AD 400 and is best known for his biography of St Martin of Tours. As we shall see, the insular version of the 84-year cycle, deriving perhaps from Sulpicius Severus, had a different structure from the *Romana supputatio,* with different rules for the date of Easter Sunday.

i. Structure and Base-Date of the Roman 84-Year Cycle

Like the 112-year cycle of Hippolytus, an 84-year cycle is based on the 28-year period after which the sequence of weekdays in the Julian calendar will repeat—the seven days of the week multiplied by the four years of the leap-year cycle. The cycle of Hippolytus was actually a 56-year period doubled. Fifty-six is the smallest multiple of 28 that is divisible by the 8-year lunar cycle. An 84-year period—the third multiple of 28—represents a more sophisticated combination of lunar months with solar years.

An 8-year cycle includes 96 ordinary months of alternate 29-day and 30-day lengths and three intercalary months of 30 days each for a total of 99 months whose 2922 days correspond exactly to eight Julian years. A 19-year cycle has 228 ordinary months and 7 intercalary months for a total of 235 months and 6936 lunar days. In each leap year, one hollow month of 29 days is increased to a full month of 30 days to compensate for the additional solar day that has accrued. Thus there are 6940 whole lunar days in a 19-year cycle, compared with 6939 whole solar days. The *saltus* compensates for this one-day difference.

An 84-year period consists of 1039 lunations—1008 ordinary months and 31 intercalary months—and 30,666 lunar days. To this total must be added the 21 leap-days that occur in an 84-year period. The resulting 30,687 days exceed 84 Julian years by six days ($365.25 \times 84 = 30{,}681$). A *saltus* must therefore be inserted six times during the period. The builder of an 84-year cycle can accomplish the necessary adjustment by dividing the period either into six sections, with a *saltus* at fourteen-year intervals, or into seven sections, with a *saltus* at the end of every section except the last.

Victorius says (Krusch 1938: 18–19) that the 84-year cycle usually had its *saltus* at twelve-year intervals, but that some placed it at the beginning of the fifteenth year. The author of the preface of Cyril refers to cycles consisting either of six 14-year sections or seven 12-year sections (Krusch 1880: 337). In critiquing deviant applications of the *saltus*, however, he mentions the illegitimate use of intervals of 14 and 16 years (Krusch 1880: 340). Bruno Krusch (1880: 96) suggested that the author had in mind the seven 16-year columns of Hippolytus, although the *saltus* does not appear there in the sixteenth year.

As we shall see, the Roman calculation to which Paschasinus and Leo refer had the *saltus* at twelve-year intervals, while the Celtic cycle to which Columban and Bede refer inserted the *saltus* every fourteenth year.

The consular list included in the *Chronograph of 354* (Mommsen 1892: 50–61) shows that an 84-year cycle, with a twelfth-year *saltus*, was known at Rome by the middle of the fourth century. The list includes 862 pairs of names, from Brutus and Collatinus to Constantius VII and Constantius Gallus III (AD 354). For each year, the author notes the age of the moon and the weekday as of 1 January. He marks with a 'b' every fourth year the bissextile years (leap-years). The sequence of weekdays repeats every 28 years. The epacts repeat at intervals of 84 years, with a few scribal errors. The epacts advance by eleven each year. The *saltus* appears at intervals of twelve years, with an advance of the epact by 12, instead of 11, again with a few scribal errors. If we assume that there was no *saltus* at the end of the cycle, then the 84-year period began with epact 1. The last such iteration begins at the consulship of Faustus II and Gallus, AD 298, when 1 January was a Saturday, moon 1.

Notations included in some manuscripts of the *Chronicle* of Prosper of Aquitania confirm that the Roman 84-year cycle had a base-date corresponding to 298 and 382. Prosper wrote an adaptation and continuation of the *Chronicle* of Jerome, ending at the year 455 with a note on Leo's decision to observe Easter in that year on 24 April. He did so, Prosper says, for reasons 'more of ecclesiastical unity than of doctrinal accuracy'. Two families of the manuscripts have notes at the years corresponding to 214, 298, and 382 (with some variants) that at these points one cycle ended and another began. At the year corresponding to AD 46, there is the note, 'Here begins the Paschal cycle that consists of 84 years and returns after 84 years to the same rule.' In the preface to his edition of the text, Mommsen argued (1892: 353) that these notes did not originate with Prosper himself. They must, however, have been added to the text not long after Prosper's own time. It is probably these notes that account for the inclusion of Prosper in Gennadius' list (*de viris illustribus* 88) of persons who were the predecessors of Victorius as authors of Paschal tables.

ii. The Ambrosian Easter-Table

Ludovico Antonio Muratori (1713) discovered a complete copy of an 84-year Paschal table in a manuscript in the Ambrosian Library at Milan. A note in a later hand at the beginning of the manuscript states that it was written in the monastery at Bobbio (Krusch 1880: 206). Hence the manuscript is sometimes referred to as ‘the Bobbio Computus’. Several computistical examples relate to the year AD 810, the probable date of composition.

This ‘Ambrosian Easter-Table’ (Krusch 1880: 236–40) has a prescript stating that the 84-year cycle begins in the consulship of Faustus and Gallus (AD 298) and is completed in the consulship of Syagrius and Antonius (382), returning to its head in the consulship of Merobaudes and Saturninus (383) and for a third time in the consulship of Pusaeus and Joannes (467). The list has five columns: (1) the numbered year from 1 through 84, (2) the weekday of 1 January, (3) the epact of the moon on 1 January, (4) the date of Easter Sunday, and (5) the epact of the moon on Easter Sunday. The 84-year table has the same sequence of epacts as the consular list in the *Chronograph of 354*, again with some scribal errors. It begins, however, one year later with Sunday, moon 12. That base-date is consistent with the statement of the prescript that the cycle returns to its head in the years corresponding to 383 and 467, which implies a starting date in 299 rather than 298. Originally, the list must have begun in 298, as the prescript states. A redactor decided to make the 84-year cycle begin in the following year, perhaps thinking it more important to have a cycle that began with Sunday, the first day of the week, rather than with the lunar epact of 1. He redacted the prescript accordingly, but neglected to change the original reference to a starting point in the year corresponding to 298.

The earliest date for Easter in the Ambrosian list is *xii Kal. Apr.*, 21 March, the 16th day of the moon, at the year corresponding to AD 303. Here the author gives a choice between that date and *xiv Kal. Mai.*, 18 April, the 15th day of the moon. Otherwise, the earliest date is 22 March, at the years corresponding to 330, 341, and 352. The latest date is *xi Kal. Mai.*, 21 April, at the years corresponding to 306, 317, and 379. The Roman limit was 21 April, as we know from Leo’s letter to Marcian (Krusch 1880: 259), among other sources.

With the exception of the double date in 303, the lunar limits are 16–22, in agreement with what Victorius says (Krusch 1938: 19) was the Latin tradition. The text does not include the date of the 14th moon. It follows, however, from the epacts and from the moons for Easter Sunday that the 14th day of the moon could fall as early as 18 March. This is consistent both with the Hippolytan list and with the statement of Victorius that the Latins reckoned the first month as beginning between 5 March and 2 April, with the Paschal full moon between 18 March and 15 April. There is an exception at the year 35, corresponding to AD 333, where the epact is 28 and Easter Sunday is 25 March, moon 22. This implies a 14th day of the moon on 17 March. Moving the 14th day of the moon forward to 15 April, which is a Sunday, would require Easter on 22 April, exceeding the Roman limit.

iii. The Vatican 84-Year Table and its Prologue

The best description of what seems to have been the *supputatio Romana* in its original form appears in the prologue to an 84-year table preserved in a sixth-century manuscript at the Vatican (Vaticanus Reginensis 2077). Giovan Domenico Mansi first published the text in 1740.[1]

The years are numbered 1–84 and identified by the names of the consuls for the year. The list begins in the consulship of Constantius VII and Constantius Gallus III, AD 354. In the prologue, however, the author describes an 84-year table organized in seven columns of twelve years each, beginning with 1 January on Saturday, the first day of the moon, in the consulship of Antonius and Syagrius, AD 382. The list, he says, includes the epact and weekday for 1 January, the calendar date for 'unleavened bread' (*azyma*), and the date of Easter Sunday with the age of the moon on that date. Easter Sunday may not fall, he says, before 22 March nor after 21 April.

By the usual Jewish rules, *azyma* should be in the evening on the 15th day of the moon. The author no doubt means by the date of *azyma* the 14th day of the moon, treating the day as beginning in the morning, as in Numbers 9:5, rather than the evening, as in Leviticus 23: 5–6. The appended table does not exhibit the columnar format, nor does it include the date of *azyma*. The lunar limits for Easter Sunday are 16–22. Although the list begins in AD 354, it preserves the same sequence of epacts as the Ambrosian table and the consular list in the *Chronograph of 354*, with the *saltus* appearing at what would have been the twelfth year of a table beginning in 298.

iv. The Cologne Prologue

Krusch (1880) undertook to collect and synthesize all of the evidence by then known for the Roman 84-year cycle. Among the texts that he published for the first time was a Paschal prologue contained in a manuscript at Cologne (Krusch 1880: 227–35). The Paschal list itself does not survive, but the prologue describes something like the Ambrosian table. The author explicitly states that the *saltus* occurs every twelfth year, except at the end of the cycle. He says that Christ was crucified on 25 March, the 15th day of the moon—the same calendar date on which the moon was created in its 15th day. Easter must be observed no earlier than the 16th day of the moon nor later than the 22nd. The calendar limits, he says, are 22 March and 21 April.

The author says that the 84-year list begins in the consulship of Diocletian VII and Maximian VI, AD 299, with 1 January on Sunday, the 12th day of the

[1] Mansi 1740: 237–42; critical edition Mommsen 1892: 739–43.

moon. That cycle ends in the consulship of Antonius and Syagrius (AD 382), and the next one begins in the consulship of Merobaudes and Saturninus, AD 383. A fragment of a similar prologue, which Krusch (1880: 241–4) also discovered at Cologne, preserves the original date, stating that the cycle ends in the consulship of Syagrius and Eucerius, AD 381.

The author of the Cologne prologue comments on the problem for the date of Easter in the fifth year of the table, where the Ambrosian list gives a choice between 21 March and 18 April, in the year corresponding to AD 303. He says that there is less reproach in observing Easter on 21 March, the 16th day of the moon, than on 28 March, the 23rd day of the moon. It is better to violate the calendar limit, as is done 'in the old table (*in veteri laterculo*)', than the lunar limit. In this and several other instances the author says that he will give a double date and leave it to the discretion of the supreme pontiff, in consultation with the presbyters, to decide which date to use.

The 'old table' to which the author refers may be the 112-year list of Hippolytus. In that list, the lunar limits are never violated, but Easter Sunday is allowed to fall as early as 20 March (see Ch. 7). Whereas the earlier limit for Easter was 20 March, the 16th day of the moon, the new limit is 22 March, the 16th day of the moon. Some scholars state that the Romans at one time restricted Easter Sunday to no earlier than 25 March, the Roman date of the equinox.[2] The only evidence for such a conclusion is the fact that in the earlier portion of the list of Easters in the *Chronograph of 354* the earliest date is 25 March, whereas the classical 84-year cycle calculates Easter for 22 March in the years AD 330 and 341. For those years, the list in the *Chronograph of 354* has 19 April, in agreement with the Athanasian Index. These dates therefore represent consultation with Alexandria, rather than a change in the Roman rules.

v. Reconstruction of the *Supputatio Romana*

From this material it is possible to reconstruct the *supputatio Romana* that Paschasinus knew as beginning in AD 382 and that the author of the *Chronograph of 354* used in calculating lunar epacts back to the first year of the Republic.

Table 8 shows the 84-year cycle. The table is based on Schwartz's reconstruction (1905: 46–9). Schwartz, however, allows the 14th day of the moon to come as early as 15 March. It is true, as Schwartz says, that the epact 30 will generate a full moon on 15 March. Whether 15 March can count as the date of the Paschal full moon depends on the rules for Easter Sunday. According to both Victorius and the Cologne prologue, Easter is restricted to moon 16–22. Victorius also says that the earliest date for the new moon of the first month

[2] Krusch 1880: 66; Mac Carthy 1901: lxxviii; Wallis 1999: xxxix; Declercq 2002: 173.

Table 8. The Roman 84-year cycle
In the column-headings, 'e' and 'd' stand for the lunar epact and day of the week as of 1 January, '14th' for the date of the Paschal full moon, 'E' and 'm' for the date of Easter Sunday and the age of the moon on that date

AD	e	d	14th	E	m	AD	e	d	14th	E	m	AD	e	d	14th	E	m
298	1	7	13A	17A	18	310	14	1	31M	2A	16	322	27	2	18M	25M	21
299	12	1	2A	9A	21	311	25	2	20M	25M	19	323	8	3	6A	14A	22
300	23	2	22M	24M	16	312	6	3	8A	13A	19	324	19	4	26M	29M	17
301	4	4	10A	13A	17	313	17	5	28M	5A	22	325	30	6	13A	18A	19
302	15	5	30M	5A	20	314	28	6	15A	18A	17	326	11	7	3A	10A	21
303	26	6	19M	a	a	315	9	7	5A	10A	19	327	22	1	23M	26M	17
304	7	7	7A	9A	16	316	20	1	25M	1A	21	328	3	2	11A	14A	17
305	18	2	27M	1A	19	317	1	3	13A	21A	22	329	14	4	31M	6A	20
306	29	3	14A	21A	21	318	12	4	2A	6A	18	330	25	5	20M	22M	16
307	10	4	4A	6A	16	319	23	5	22M	29M	21	331	6	6	8A	11A	17
308	21	5	24M	28M	18	320	4	6	10A	17A	21	332	17	7	28M	2A	19
309	2	7	12A	17A	19	321	15	1	30M	2A	17	333	28	2	17M	25M	22

a. Double date. Easter 21M or 18A, Moon 16 or 15.

AD	e	d	14th	E	m	AD	e	d	14th	E	m	AD	e	d	14th	E	m
334	10	3	4A	7A	17	346	23	4	22M	30M	22	358	6	5	8A	12A	18
335	21	4	24M	30M	20	347	4	5	10A	12A	16	359	17	6	28M	4A	21
336	2	5	12A	18A	20	348	15	6	30M	3A	18	360	28	7	c	c	c
337	13	7	1A	3A	16	349	26	1	19M	26M	21	361	9	2	5A	8A	17
338	24	1	21M	26M	19	350	7	2	7A	15A	22	362	20	3	25M	31M	20

339	5	2	9A	15A	20	351	18	3	27M	31M	18	363	1	4	13A	20A	21
340	16	3	29M	6A	22	352	29	4	16M	b	b	364	12	5	2A	4A	16
341	27	5	18M	22M	18	353	10	6	4A	11A	21	365	23	7	22M	27M	19
342	8	6	6A	11A	19	354	21	7	24M	27M	17	366	4	1	10A	16A	20
343	19	7	26M	3A	22	355	2	1	12A	16A	18	367	15	2	30M	1A	16
344	30	1	13A	15A	16	356	13	2	1A	7A	20	368	26	3	19M	23M	18
345	11	3	3A	7A	18	357	24	4	21M	23M	16	369	7	5	7A	12A	19

b. Double date. Easter 22M or 19 A, Moon 20 or 19.
c. Double date. 14th Moon 17M or 15A, Easter 26M or 16 A, Moon 23 or 15.

AD	e	d	14th	E	m
370	19	6	26M	28M	16
371	30	7	13A	17A	18
372	11	1	3A	8A	19
373	22	3	23M	31M	22
374	3	4	11A	13A	16
375	14	5	31M	5A	19
376	25	6	20M	27M	21
377	6	1	8A	16A	22
378	17	2	28M	1A	18
379	28	3	15A	21A	20
380	9	4	5A	12A	21
381	20	6	25M	28M	17

was 18 March. According to the preface to the Vatican list, Easter cannot fall before 22 March. By these rules, a 14th day of the moon on 15 March could count as the Paschal full moon only when 15 March is a Saturday or Sunday. Such is not the case in any of the three years for which the structure of the cycle generates an epact of 30.

The Ambrosian table and the 84-year list in the Vatican manuscript both give dates for Easter in April in each of the years where Schwartz allows the 14th moon to fall before 18 March—with three exceptions. For the year 6 (AD 303 and 387), the Ambrosian table offers a choice between 21 March, moon 16, and 18 April, moon 15. The Vatican list has *vi Kal. Apr.*, moon 21—an error perhaps for *v Kal. Apr.* (28 March), moon 22. The author has changed the epact for the year from 26 to 27, which would produce moon 22 for 28 March and make that a valid date.

The second exception is at year 36, corresponding to AD 333 and 417, where the epact is 28, and the 14th day of the moon must be either 17 March or 15 April. April 15th was a Sunday, and Easter on 22 April would exceed the Roman limit. The Ambrosian table and the list in the Vatican manuscript both date Easter to 25 March. The same problem recurred in 501. The Roman 84-year cycle had in the meantime been superseded (or at least supplemented) by the 532-year Paschal list of Victorius of Aquitania. Victorius calculated 22 April, moon 19, for the year 501. Pope Symmachus nevertheless decided to observe Easter on 25 March in that year, disagreeing not only with the Alexandrians, but also with much of Italy. Someone added a note to the Victorian table stating that the Romans observed Easter in that year on 25 March, moon 21 (Krusch 1938: 50). Symmachus' enemies took advantage of the decision to accuse him of this and other crimes against the church. King Theodoric appointed an episcopal visitor to celebrate Easter on 22 April and to administer the Roman church. The result was a series of synods, from which Symmachus emerged reconfirmed in possession of his see.[3]

The third exception is at year 55, AD 352 and 436, where the epact is 29, producing a 14th day of the moon on 16 March or 14 April. The Ambrosian table gives a choice between 22 March, moon 21, and 19 April, moon 18, for Easter Sunday. The table in the Vatican manuscript has 22 March, moon 21. Here the calculations are incorrect. March 22nd should be the 20th day of the moon, 19 April the 19th day.

Schwartz follows the textual evidence in his list of Easter dates, but in his list of Paschal full moons allows the date to fall back to 15 March. In my reconstruction, I have restricted the 14th day of the moon to the limits that Victorius specifies, except at the year 36. In deciding what dates in April to use for epacts

[3] For the evidence and a reconstruction of the events, see Townsend 1937.

28, 29, and 30, I have followed the moon for Easter Sunday given in the Ambrosian table and in the Vatican manuscript. The somewhat anomalous result is that 13 April is the date of the Paschal full moon at both epact 1 and epact 30. Holford-Strevens (1999: 806) has explained the anomaly as resulting from the way embolismic months are treated.

My reconstruction follows the Ambrosian table in giving alternative dates for Easter in the years corresponding to AD 303 and 352. At the year 63, corresponding to AD 360 and 444, the cycle produces an Easter Sunday either on 26 March, moon 23, or on 16 April, moon 15. Neither is a valid date; hence the dispute reflected in the correspondence between Leo and Paschasinus. By the Alexandrian calculation, the date was 23 April, moon 19. According to Ambrose (Letter on Easter, *Extra Collectionem* 13.21), the church at Milan observed Easter on that date for the year 360. It was perhaps at that time that the Milanese adopted the Alexandrian 19-year cycle (see Ch. 9).

2. THE 84-YEAR CYCLE WITH 14TH-YEAR *SALTUS*

Scholars are in agreement that what we can call the 'classical Roman 84-year cycle' took the form shown in Table 8. There is disagreement, however, as to the origins and possible permutations of this cycle.

i. The Theory of Bruno Krusch

Both Victorius and the author of the preface of Cyril refer to an 84-year cycle organized in sections of 14 years, rather than 12. Krusch argued that this was the original form of the Roman 84-year cycle and that the earlier portion of the list of Easter dates included in the *Chronograph of 354* was based upon a modification of it.

The list of Easter Sundays in the Chronograph of 354

Appended to the full consular list with no intervening title or heading, is a 100-year consular list beginning in the consulship of Constantine II and Licinius II, AD 312 (Mommsen 1892: 62–4). Aegidius Bucher first published this 100-year list in 1634, from a manuscript in Brussels. In 1696, Enrico Noris published the full consular list of 862 names from a Viennese manuscript. The Brussels and Viennese manuscripts both derive from a single illustrated ninth-century manuscript of the *Chronograph of 354*, known to

Table 9. The 100-year list of Easter dates in the *Chronograph of 354*
Dates prescribed by the 84-year cycle or Alexandrian dates are given when they differ.
The significance of an asterisk by an Alexandrian date is explained in the text

Year	Chron	84	Alex	Year	Chron	84	Alex	Year	Chron	84	Alex
312	13A	—	—	346	30M	—	30M*	379	21A	—	—
313	29M	5A	29M	347	12A	—	—	380	12A	—	—
314	18A	—	—	348	3A	—	—	381	28M	—	—
315	10A	—	—	349	26M	—	26M*	382	17A	—	—
316	25M	1A	25M	350	15A	—	8A	383	9A	—	—
317	14A	21A	14A	351	31M	—	—	384	24M	—	—
318	6A	—	—	352	19A	—	—	385	13A	—	—
319	29M	—	22M	353	11A	—	—	386	5A	—	—
320	10A	17A	10A	354	27M	—	—	387	18A	a	25A
321	2A	—	—	355	16A	—	—	388	9A	—	—
322	25M	—	22A	356	7A	—	—	389	1A	—	—
323	7A	14A	7A	357	30M	23M	23M	390	21A	—	—
324	29M	—	—	358	12A	—	—	391	6A	—	—
325	18A	—	—	359	4A	—	—	392	28M	—	—
326	10A	—	3A	360	16A	—	23A	393	17A	—	—
327	26M	—	—	361	8A	—	—	394	2A	—	—

328	14A	—	—	362	31M	—	—	395	25M	—	—
329	6A	—	—	363	20A	—	—	396	13A	—	—
330	19A	22M	19A	364	4A	—	—	397	5A	—	—
331	11A	—	—	365	27M	—	—	398	18A	—	—
332	2A	—	—	366	16A	—	—	399	10A	—	—
333	15A*	25M	15A	367	1A	—	—	400	1A	—	—
334	7A	—	—	368	20A	23M	20A	401	14A	21A	21A**
335	30M	—	—	369	12A	—	—	402	6A	—	—
336	18A	—	—	370	28M	—	—	403	29M	—	—
337	3A	—	—	371	17A	—	—	404	10A	17A	17A
338	26M	—	—	372	8A	—	—	405	2A	—	—
339	15A	—	—	373	24M	31M	31M	406	25M	—	22A
340	30M	6A	30M	374	13A	—	—	407	14A	—	—
341	19A	22M	19A	375	5A	—	—	408	29M	—	—
342	11A	—	—	376	27M	—	—	409	18A	—	—
343	3A	—	—	377	16A	—	—	410	10A	—	—
344	15A	—	—	378	1A	—	—	411	26M	—	—
345	7A	—	—								

a. Double date, 21M/18A.

have been in Luxembourg in the sixteenth century. That manuscript came into the possession of Nicholas-Claude Fabri de Peiresc in the 1620s, but has not been seen since his death in 1634.[4]

Alongside each pair of consular names in the 100-year list is a calendar date. All these dates, scribal errors aside, are Sundays in the month of March or April. This is therefore not a consular list, in the usual sense of the term, but a list of dates for Easter Sunday in which the years are identified (sometimes incorrectly) by the names of the consuls. The list is disturbed by the omission of nine pairs of names between the consuls for 358 and 368 and by the erroneous repetition of several dates in the middle of the list.

If this list is the work of the original author, then as a historical record it must have ended in AD 354. Either it was projected forward by the original author through some method of calculation, with the consular names added by a later copyist, or the latter portion is a later addition in its entirety.

Table 9 reproduces this list as restored and corrected in Mommsen's edition. The table also shows the dates for Easter Sunday, where they differ, as given by the 84-year cycle and by the Alexandrian 19-year cycle. For the period between 328 and 373, the list overlaps with that of the Athanasian Index, and I have used the dates given in that text. For the earlier and later portions of the 100-year list, the table shows the dates as calculated by the Alexandrian 19-year cycle in its classical form.

An asterisk (*) after an Alexandrian date means this is the date of Easter according to the Athanasian Index, differing from the calculated date. The double asterisk (**) for the year 401 indicates a set of problems. The date is *xvii Kal. Mai.* in the *Chronograph of 354*, 15 April, which was not a Sunday. The list in the 84-year cycle beginning in 354 in the Vatican manuscript gives the date as *xi Kal Mai.*, 21 April. The date is 21 April according to the Anatolian cycle as I have reconstructed it. The date is 14 April in the classical cycle.

The following discussion is limited to questions bearing on the origins of the 84-year cycle and does not take up every point of agreement or disagreement between the list in the *Chronograph of 354* and other sources.

Bucher believed that the list of Easter Sundays was based on an 84-year cycle with a *saltus* at fourteen-year intervals. Noris erroneously came to the same conclusion about the lunar epacts included in the full consular list. The publication in 1713 of the Ambrosian table showed that the classical 84-year cycle had the *saltus* at 12-year intervals. Joannes van der Hagen followed the sequence of epacts attested by the Ambrosian table in his reconstruction of the classical 84-year cycle. He nevertheless agreed (1733: 358) with Noris that the earliest form of the cycle was divided into 14-year periods.

[4] For Peiresc's description of the manuscript, see Mommsen 1892: 19–29.

Krusch revived this hypothesis in a new form (1880: 35, 43, 65–9). Krusch noted that the Paschal list in the *Chronograph of 354* agrees completely with the classical 84-year cycle only for the period between 343 and 354. For the period between 312 and 342, there are several divergences. In particular, for the years corresponding to 330 and 341, the classical 84-year cycle produces Easter Sunday on 22 March. The *Chronograph of 354* has Easter on 19 April in these years. For the period after 354, the dates generally agree with the classical 84-year cycle. There are some divergences, but they are less frequent than in the earliest portion of the list.

Krusch concluded that the list of Easter Sundays in the *Chronograph of 354* was based on one method of calculation for the period from 312 to 342, another for the period 343–54. For the period from 355–412 he thought the list to be the work of a later author who was careless in his methods. Krusch therefore distinguished between an older *supputatio Romana* and a newer calculation that represented a reform. Both versions of the cycle used a *saltus* at twelve-year intervals. The older method had lunar limits for Easter Sunday of 14–20 and restricted Easter to the period between 25 March and 21 April. The later version, apparently introduced about 343, perhaps in connection with the Council of Sardica, according to Krusch, observed the limits described by Victorius—Easter Sunday must fall between the 16th and 22nd day of the moon and between 22 March and 21 April. Krusch believed that the list beginning in AD 354 in the Vatican manuscript is another and better continuation of the *Chronograph of 354*, based on the reformed *supputatio Romana*.

The Carthaginian Computus of 455

Krusch argued (1880: 15–16) that the older *supputatio Romana* derived from a Paschal list composed some time in the third century by one Augustalis. He identified the *vetus laterculus* ('old list') mentioned in the Cologne prologue not with the 112-year list of Hippolytus, but with the Paschal calculations of Augustalis.

Augustalis is mentioned only in a text known as the 'Carthaginian Computus of 455'. This text is included in the well-known chronographical manuscript of the eighth century preserved in the cathedral library at Lucca (Bibl. Cap. 490). Giovan Domenico Mansi first published the text in 1761 (repr. *PL* 59: 545–60). It received little scholarly attention until Krusch (1880: 279–97) rediscovered the text more than a hundred years later.

This tract *de ratione Paschae* is the preface to a Paschal table based on the 84-year cycle. The table itself has not survived. In the preface (Krusch 1880: 280–91), the author says that the present year is the 16th year of the Vandal

King Geiseric, the 426th year since the Passion. The date corresponds to AD 455, 426 years after the traditional Roman date of the Passion in AD 29. Since he dated by reference to the Vandal king, the author was probably a Carthaginian. He says that he composed two Paschal cycles. One began with epact 2 in the year corresponding to AD 439, with the fourteenth day of the Paschal moon on 12 April, a Wednesday, recapitulating the data for the first Passover in Egypt. The other began in the tenth year of Geiseric, 420 years after the Passion, AD 449, recapitulating the data for the year of the Passion, with 25 March coinciding with the 16th day of the moon and Easter on 27 March.

The author criticizes two of his predecessors. One was Agriustia, for whom the writer has nothing but contempt. He says that Agriustia was a citizen of Thimida Regia and wrote to Hilarianus about a method for distributing the *saltus* throughout each year of the cycle. Instead of treating the epact as advancing by $11 + 1/12$ days each year, Agriustia used a complicated series of fractions that had the effect of advancing the epact by $11 + 1/14$.[5] The Hilarianus to whom he wrote is probably the same person as the bishop Quintus Julius Hilarianus who wrote a tract about the correct month and day for Easter, subscribed on the third day before the Nones of March in the year after the consulship of Arcadius IV and Honorius III, 5 March AD 397 (*PL* 13. 1114). Agriustia's formula does not necessarily imply the use of a *saltus* at the fourteenth year. The addition of $1/14$ of a day per year distributes the six extra days required in an 84-year cycle, regardless of the position of each *saltus* within the cycle.

The other writer whom the Carthaginian mentions is Augustalis (Krusch 1880: 280–1, 289–90). He has great respect for Augustalis, to whom he refers as being 'of blessed memory' and a man of great computistical knowledge and skill. He criticizes Augustalis for two errors. First, he says that Augustalis misplaced the *saltus* in six out of seven instances. Second, Augustalis made a mistake in claiming that the first year of his cycle recapitulated the data for the year of the Passion. He quotes Augustalis as stating that his cycle begins in the consulship of Antoninus and Albinus, in the 186th year since the consulship of the two Gemini, the year of the Passion, and that the head of the cycle produces the same data as in the year of the Passion. This is wrong, the Carthaginian computist says, because the data repeat at 84-year intervals and it therefore ought to be in the 169th year that the data for the Passion recur. He then compares the head of his cycle with that of Augustalis, as follows (Krusch 1880: 290):

Our cycle: 1 January, moon 22, seventh day of the week; 14th day of the first month on 23 March, fourth day of the week; Easter Sunday 27 March, moon 18.

[5] Krusch 1880: 25–9, Schwartz 1905: 61, Willis 1972, Mosshammer 2009.

Augustalis: 1 January, moon 20, day 6; 14th of first month 25 March, day 5, Easter Sunday, 28 March, moon 17.

The consulship of Antoninus and Albinus was the year 213. In making that year the 186th since the year of the Passion, AD 29, Augustalis counted one year too many. In fact, the weekdays for the year 213 correspond to the year 28, not 29. Augustalis apparently thought that the crucifixion took place on 25 March, the 14th day of the moon, and that the appearance of that datum at the head of his table was worth remarking. Victorius of Aquitania also dates the Passion to the year 28 (see below).

The Munich Computus

The Carthaginian computist attributes to Augustalis 'six out of seven' errors in the *saltus*. Krusch concluded that Augustalis must have placed the *saltus* at 14-year intervals, instead of twelve, and that his list included more than one cycle of 84 years. A seventh *saltus* implies a cycle of at least 98 years. He found evidence for just such a cycle in a ninth-century manuscript at Munich (Bayerische Staatsbibliothek, Clm 14456). Krusch (1880: 10) dated the text to 689, Mac Carthy (1901: lxx) and Schwartz (1905: 91) to 718/19.

Krusch, Mac Carthy, and Schwartz have quoted from several portions of the text.[6] Immo Warntjes prepared a critical edition of the entire text in his doctoral dissertation at the University of Galway (2007). Transcripts, translations, and photographic reproductions of the passages I cite may also be found in Warntjes 2007: 39, 53, 62–3, 83–5.

The computist was an advocate of the 19-year cycle. Among the other methods of calculation that he mentions is a *latercus*. The word is a false derivative of *laterculus*, the usual word in Latin for a list and among Christians for a Paschal list. The form *latercus* appears in texts from Britain and Ireland and especially in reference to the peculiar form of the 84-year cycle there in use.[7]

The Munich computist compares the *latercus* with the 532-year table of Victorius. He says that they agreed in the sequence of epacts until the year where the *saltus* intervenes, moving the epact from 12 to 24. Victorius' table begins with epact 19 and moves from 12 to 23 at the end of the 14th year. Thus the computist seems to be describing a list with a 14th-year *saltus*. Elsewhere he says that the *latercus* has the *saltus* at intervals of 12 years, beginning in the fourth year of the ogdoad. As Krusch, Mac Carthy, and Schwartz all have noted, 12 must be an error for 14. In the table of Victorius, the 14th year of the list is the fourth year of an ogdoad. The author then describes the *saltus* at

[6] Krusch 1880:10–11; Mac Carthy 1901: lxxii–lxxiv; Schwartz 1905: 92, 94, 101.
[7] McCarthy and Ó Cróinín 1988: 228 and 242 nn. 13–14.

five positions, moving from 12 to 24, from 17 to 29, from 22 (text: 15) to 4, from 27 to 9, and from 2 to 14 (text: 13). The numbers show that the *saltus* appeared at fourteen-year intervals. Krusch (1880: 11) concluded therefore that the *latercus* must have been based on an 84-year cycle, although the computist does not mention the sixth *saltus* that should have been there. The computist also says that the *latercus* used the lunar limits 14–20.

Elsewhere, the Munich computist refers to a cycle of 100 years:

> Others have composed a cycle of 100 years, in which the cycle of the moon repeats five times with five years left over and the cycle of the sun repeats three times with 16 days (*sic*!, correctly 'years') left over. So the sun and the moon are not congruent. In the cycle the *saltus* happens at the 14th year. The sun exceeds the moon by five days.

Krusch (1880: 11–15) identified this 100-year list with the *latercus* that the computist describes and concluded that it was in fact the *laterculus* of Augustalis. Beginning in AD 213, it would have ended in AD 312. The list beginning in that year in the *Chronograph of 354* was a continuation of Augustalis, preserving the lunar limits of Augustalis, but with the *saltus* now at intervals of twelve years. In the 340s, however, perhaps as a result of the discussions at Sardica, the Romans abandoned the cycle of Augustalis entirely, and the classical 84-year cycle superseded it. In Krusch's judgment, the list from 312 to 342 records actual historical observations of Easter Sunday at Rome, while the Easters from 343 to 354 were based on calculations.

In his discussion of Paschal cycles, Bartholomew Mac Carthy (1901: lxvii–lxxxii) devoted considerable attention to the 84-year cycle described in the Munich computus. Like Krusch, he identified that *latercus* with the 100-year list that the computist also mentioned. Unlike Krusch, he denied the identification of that list with the cycle of Augustalis. In particular, he points out, the *latercus* began in agreement with Victorius and therefore with epact 19. The Carthaginian computist says that Augustalis began with epact 20. On the basis of the *latercus*, Mac Carthy nevertheless reconstructed the 84-year cycle with a 14th-year *saltus* in much the same way as had Krusch. Like Krusch, he regarded it as the original form of the 84-year cycle and the source of the later Celtic calculations.

Mac Carthy was right to disconnect the *latercus* described by the Munich computist from the *laterculus* of Augustalis. He nevertheless shared the belief of Krusch that the *latercus* described by the Munich computist was a 100-year list. The inference is erroneous. The computist describes the *latercus* in such a way that it must have had its *saltus* at the 14th year. He also explicitly says that the hundred-year list has the *saltus* in the 14th year. These are, however, two separate descriptions. The former appears on fo. 42^{v}, at the end of a 15-page description of different methods of Paschal calculation. The author then argues that only the 19-year cycle is correct. The latter appears on fo. 44^{r}, where the author lists five kinds of cycles.

The first of the five kinds of cycle is the Roman 84-year cycle with 12th-year *saltus*. The second is the 112-year cycle of Hippolytus. Third, he mentions the 95-year cycle, with its *saltus* in the 19th year. Fourth, he says that 'others' compose a cycle of 100 years with a *saltus* in the 14th year. The fifth is the 532-year cycle of Victorius.

This list overlaps with the various methods that the computist has earlier described. Only the *latercus* had a 14th-year *saltus*, but it does not follow that the *latercus* and the hundred-year list are the same. The computist describes the latter as a *ciclus*, not a *latercus*. Immo Warntjes (2007: 47–8, 55–6) has recently argued that these descriptions derive from two different sources. The *latercus* was an 84-year list with a 14th-year *saltus*. The *ciclum* was a hundred-year list, based on the 84-year cycle with a 14th-year *saltus*, but extended to an even hundred years in imitation of other such lists, such as the 100-year list included in the *Chronograph of 354*.

Krusch connected the five revolutions of the moon in the 100-year list with the five positions of the *saltus* in the *latercus*. He thought that the computist mentioned only the first five positions because from his perspective as an advocate of the 19-year cycle, a 100-year list should have the *saltus* only five times. Mac Carthy thought that the sixth *saltus* was in the original description, but that the 'continental scribe' omitted it. Schwartz suggested that the computist himself failed to mention the sixth *saltus* because it occurred at the end and became visible only at the beginning of the next cycle.[8]

Schwartz was right. In an 84-year cycle with a 14th-year *saltus*, the 12-day advance of the epact appears only five times. The sixth *saltus* appears at the beginning of the next cycle. In a list that covered exactly 84 years the sixth *saltus* is invisible. The fact that the computist mentions only five positions shows that the *latercus* was in fact an 84-year list, not a 100-year list.

Apart from having the *saltus* at the 14th year, the author's reference to a 100-year cycle is reminiscent more of the list of Theophilus, based on the 19-year cycle, than any version of the 84-year cycle. His source for the cycles he describes seems to have been Victorius, who mentions variant cycles of 84, 112, and 95 years, with *saltus* respectively at 12, 16, and 19-year intervals (Krusch 1938: 18–19). He adds that some versions of the 84-year cycle had a *saltus* at the beginning of the 15th year. Like Victorius, the author erroneously states that the 112-year cycle had its *saltus* at the 16th year. Victorius also mentions the 100-year list of Theophilus, without specifying its *saltus* (Krusch 1938: 21). The author of the preface of Cyril says (perhaps wrongly, see Ch. 10) that Theophilus composed a 100-year list with its *saltus* at the 19th year (Krusch 1880: 340). That the compiler of the Munich computus meant 14 and not 19, however, seems to

[8] Krusch 1880: 14; Mac Carthy 1901: lxxiv; Schwartz 1905: 94; cf. Warntjes 2007: 54–6.

follow from the fact that he compares it with a 19th year *saltus* and adds 'in which number (i.e. 14) the sun exceeds the moon by five days.'

Most likely, the author knew of the 100-year list of Theophilus from Victorius. Victorius did not specify its *saltus*, but he did mention a *saltus* at the beginning of the 15th year as among the variants. The author of the Munich computus wrongly concluded that the 100-year list of Theophilus had its *saltus* at the 14th year. There is in any case little justification for connecting this 100-year list mentioned by the Munich computist with the 84-year *latercus* and none for identifying it with the *laterculus* of Augustalis.

ii. The Arguments of Eduard Schwartz

Schwartz (1905: 50–8) took issue with Krusch's conclusions. In his opinion, the Roman church never used any version of the 84-year cycle except that represented by the classical cycle. By comparing the list in the *Chronograph of 354* with the Athanasian Index for the period where they overlap (328–73), Schwartz showed that the departures from the classical 84-year cycle in the Roman list represent, with very few exceptions, concessions to the Alexandrian date. The list in the *Chronograph of 354* is an historical list of Easters as actually observed at Rome, not a calculated list.

It is unlikely, Schwartz maintains, that any Roman calculation of the fourth century would have abandoned the lunar limits of 16–22 attested both by the Paschal list of Hippolytus and by Victorius. The Carthaginian computist never criticizes Augustalis for using a *saltus* other than at twelve-year intervals. His criticism is that Augustalis placed the twelve-day augment in the epact at the wrong years in his cycle. It does not follow from the fact that the cycle of Augustalis began at the year corresponding to AD 213 that Augustalis composed the cycle in the third century. On the contrary, his decision to recalibrate the cycle to bring the 14th moon of 25 March to its head represents an innovation not otherwise attested before the fifth century. The Carthaginian computist describes Augustalis as having marked off his cycle into ogdoads and hendecads, and he adopted that practice for his own cycles. Such divisions, according to Schwartz (1905: 64, 102), are alien to the structure of the 84-year cycle and reflect the influence of the 19-year cycle as well established by the time that Augustalis worked.

Schwartz argued (1905: 89–100) that the *latercus* described in the Munich manuscript is also a late compilation. Its use of a *saltus* at 14-year intervals, with lunar limits of 14 to 20, reflects the influence of a peculiar form of the 84-year cycle known to have been used in the British islands.

iii. The Celtic 84-Year Cycle

We know of the Celtic 84-year cycle primarily through those who defended it against other methods of calculation, especially during the seventh century, as well as several pseudepigraphic documents claiming ancient support for it.[9] The descriptions of its defenders do not include such details as the position of the *saltus* and rarely even that it was an 84-year cycle. St Columban of Ireland in defending the Celtic lunar limits does say that he prefers his native 84-year cycle over more recent inventions. That the *saltus* appeared at the end of the 14th year is a reasonable inference from the statement of Victorius (Krusch 1938: 19) that some 84-year cycles were structured in that way. From St Columban, among others, we do know that the Celtic tradition prohibited Easter Sunday before the Roman date of the equinox on 25 March and restricted the moon of Easter to the 14th–20th day. Columban says (Letter 1, p. 4 Walker) that it is wrong to celebrate the Resurrection before the Passion or the Passion before the equinox. He does not give a date for the equinox. He does cite with approval (Letter 1, pp. 2, 8 Walker) the pseudepigraphic 'Book of Anatolius', in which the date of the equinox is given as 25 March. What Columban implies therefore is that Passover should not be observed before 25 March nor Easter before 26 March.

Schwartz rightly thought that the *latercus* described by the Munich computus was a cycle of this type. He despaired (1905: 102) of ever being able to reconstruct the original form of what he called the 'Irish' cycle from the evidence then available. In 1985, Dáibhí Ó Cróinín discovered in a manuscript at Padua an 84-year table with a 14th-year *saltus*.[10] The table appears in the manuscript together with a copy of the *Liber de Ratione Paschali* attributed to Anatolius. Daniel McCarthy (1993) examined the text and concluded that the Paduan cycle was based on the peculiar lunar table included in the Anatolian tract. He reconstructed the original form of that cycle beginning with epact 19 at a base-date corresponding to AD 438 and the *saltus* at 14-year intervals. The earliest date for Easter is 26 March, the latest 23 April, with lunar limits of 14–20.[11] Unlike the Roman 84-year cycle, the *latercus* produces valid dates for Easter in every year of the cycle.

McCarthy (1994) suggested that this was the cycle constructed by Sulpicius Severus at the beginning of the fifth century, with a base-date originally in AD 354, chosen in honour of St Martin, who was baptized in that year. He argued that Severus used the lunar table found in the Anatolian text as the basis for

[9] Mac Carthy 1901: cxv–clix; Wallis 1998: lv–lxiii.
[10] McCarthy and Ó Cróinín 1988.
[11] See also the discussion and reconstructed table in Holford-Strevens 1999: 870–5.

his work and adopted its lunar limits of 14–20, with an equinoctial date of 25 March.

Both Faith Wallis and Leofranc Holford-Strevens have accepted McCarthy's reconstruction of the Celtic 84-year cycle. Wallis finds the attribution to Sulpicius Severus unconvincing. Holford-Strevens endorses McCarthy's argument and suggests that Severus modified the cycle of Augustalis. Immo Warntjes has recently published a study comparing the *latercus* described by the Munich computus with the Paduan exemplar. He concludes that they are not identical, but that they both represent what he calls the '84 (14)'. He denies any connection with the *laterculus* of Augustalis and accepts McCarthy's argument that it was the work of Sulpicius Severus.[12]

3. THE HISTORY OF THE 84-YEAR CYCLE

Many scholars have accepted Schwartz's conclusion that there was only one *supputatio Romana*, adopted no later than the middle of the fourth century and perhaps as early as 312, and that this 84-year cycle placed the *saltus* at 12-year intervals and followed the rules that Victorius attributes to the Latins.[13] Nevertheless, the idea persists that Augustalis was an African computist of the third century who composed, on the basis of an 84-year cycle with a 14th-year *saltus*, a 100-year Paschal list beginning in AD 213, with lunar limits of 14–20.[14]

i. The *Laterculus* of Augustalis

We know nothing of the work of Augustalis beyond what the computist of 455 reports. That author writes in a barbarous style that is not always fully intelligible. One thing, at least, is clear: the computist of 455 never says that Augustalis produced a 100-year list. The 100-year list was an inference of Krusch based in part on a false distinction between a 'cycle (*ciclus*)' and a 'list (*laterculus*)'. Krusch claims (1880: 7) that the computist's reference to the work of Augustalis as a *laterculus* means that it was not cyclical and did not return to its head at the end of the list. Krusch overlooks the fact that the computist himself uses the word *laterculus* in reference to the 84-year cycle

[12] Wallis 1998: lvi n. 116; Holford-Strevens 1999: 872; Warntjes 2007: 32, 65, 70.

[13] Ginzel 1906–14: iii. 241–3; Richard 1974: 316, 327–8; Strobel 1977: 229–32; Wallis 1999: xlv n. 69; Warntjes 2007: 32.

[14] Ginzel 1906–14: iii. 243; Strobel 1977: 273–4; Holford-Strevens 1999: 793, 806, 972; Lejbowicz 2006: 21.

when he says (Krusch 1880: 280) that every *laterculus* must contain thirty-one embolismic months.

Krusch's claim that the Carthaginian computist characterized Augustalis as having inserted a seventh *saltus* in his *laterculus* places too heavy a burden on a fragile text. Since a seventh *saltus* is alien to the whole structure of the 84-year cycle, it follows, according to Krusch (1880: 12–14), either that the Carthaginian computist was wrong, or that Augustalis used the seventh *saltus* for the additional sixteen years that he appended to the 84-year cycle. Either way, the computist's complaint derives, according to Krusch, from the fact that Augustalis used a 14-year interval for the *saltus*. Schwartz maintained that Augustalis inserted the *saltus* six times at twelve-year intervals, but aligned the *saltus* with respect to the structure of the table differently from what the computist considered to be correct. Neither hypothesis accounts for the phraseology of the Carthaginian's complaints.

The computist discusses the work of Augustalis twice. On the first occasion, he is discussing the fractional days that accumulate in the course of an 84-year cycle. He says that the moon gains fractionally each year such that the fractions accumulate to one unit (*as*) every twelve years. The passage can be literally translated as follows:

> Therefore 84 twelfths is seven and seven times twelve, you would have 84 years, in which Augustalis (of holiest memory) six out of seven units in his ogdoads and hendecads has not noted at the right places and positions, which the annual twelfths come to in 84 years. For which reason in his circles an error sometime is found, when in the number of the years and the courses of the elements there is not clear attention, although one unit out of seven in eighty-four years is always subtracted and never at all allowed in the Paschal calculation. That unit, if I am not mistaken, he inattentively put into its own lunar course, which rather departs as superfluous from whole insertions. This is what gives rise to Paschal errors, as is shown in the written series of years. (Krusch 1880: 280.)

The author explains that in 84 years the advance in the epact by 11 and one-twelfth days each year will accumulate to 931 days. Divide by thirty, and you will find the 31 embolismic months that each cycle contains. There remains that one unit, which at the end of the 84 years must always be subtracted from the seven units that the lunar fractions have generated. He digresses briefly to discuss the theories of Agriustia, then returns to Augustalis:

> Be sure therefore that this unit should by all means be declined. But if Augustalis, as I said, had put six units in the parts of his table, at fixed intervals, no flaw would have occurred in his lunar course and Paschal years, which error this excessive unit in his lunar course seems variously to cause. With a lesser element in the third circle †thirtieths† in the twenty-fourth year the lunar course is concluded. (Krusch 1880: 281.)

From this garbled description it is impossible to reconstruct the cycle of Augustalis and difficult to infer just what fault the computist of 455 found in it. The obelized word 'thirtieths' translates *tricesimario*, which modifies *circulo* and refers to divisions into thirtieths. The sentence apparently refers to the division of an 84-year cycle into two sections of 30 years each and a third section of 24 years. The computist organized his own cycle in that way, as he tells us in the next section of the text. He is probably referring to his own circles in this last sentence and does not mean to say that the laterculus of Augustalis was divided in the same way.

At the beginning of the first selection, the author seems to be saying that Augustalis correctly accumulated one day every twelve years, for a total of seven, but misplaced six of them. That statement implies that Augustalis handled the seventh unit correctly, by suppressing it. At the end of that selection, however, he criticizes Augustalis for not suppressing that last unit at the end of the cycle. Krusch concluded that Augustalis must have inserted a seventh *saltus*. Therefore, according to Krusch, Augustalis must have composed a list of more than 84 years, with the seventh insertion of an additional day serving as the *saltus* required for the last section.

Krusch's explanation does not address the main complaint, which is displacement of the epacts. If Augustalis, he says, had inserted six units at fixed intervals, no error would have arisen. He also says that Augustalis organized his cycle by ogdoads and hendecads. An alternation of ogdoads with hendecads would produce a cycle with a column of 27 years, followed by a column of 30 years, concluding with another column of 27 years. If Augustalis inserted a *saltus* at the end of each column, with another in each column at the end of an ogdoad or hendecad, he correctly included six such units, but they would not have appeared at fixed intervals. A *saltus* at the end of the cycle would appear to the Carthaginian as the inclusion of a unit that ought to have been suppressed (Mosshammer 2009).

When the computist mentions Augustalis again later in his discussion, his complaint is about the year that Augustalis chose as his base-date (Krusch 1880: 289–90). He criticizes Augustalis for counting the consulship of Antoninus and Albinus as the 186th year since the Passion and claiming that the lunar data for the Passion repeat at that year. The consulship of Antoninus and Albinus corresponds to AD 213. Thus, the beginning of the list is displaced by one year with respect to the classical cycle. Whereas the Ambrosian table and the Cologne prologue begin in the second year of the classical cycle, when 1 January was a Sunday with epact 12, Augustalis displaced the list by one year in the other direction, with 1 January on Friday, epact 20. The result is to bring 25 March to the head of the list of dates for the 14th day of the moon.

The Carthaginian computist never says that Augustalis inserted his *saltus* at the end of the 14th year. Nor does he say what rules Augustalis followed for the date of Easter Sunday or the age of its moon. There is no basis for the claim that Augustalis restricted Easter to between the 14th and the 20th day of the moon and no earlier than 25 March.

Whatever the meaning of the complaints about his handling of the seventh accumulated unit in the epact, the work of Augustalis is best understood as being, like the Ambrosian table, a secondary modification of the classical cycle. The Ambrosian author shifted the base-date down by one year in order to make the list begin with 1 January on a Sunday. Augustalis shifted the base-date up by one year in order to bring Passover on 25 March to its head. He also disturbed the sequence of the epacts in some way that the Carthaginian computist failed intelligibly to describe.

Schwartz (1905: 64) was right to place Augustalis in the fifth century, rather than the third. Earlier Paschal calculations made no attempt to connect the first year of a cycle with the year of the Passion. Several texts of the fifth century, however, do just that. The earliest consists of fragments of a consular list organized in cycles of 84 years. A. W. Cramer first published the fragments in 1826, from a manuscript he discovered in 1816 in Zeitz, a town in eastern Germany mid-way between Erfurt and Dresden.[15] Hence the document has come to be known as the 'Zeitzer table'. A portion of the preface is extant. The author states that he has composed five 84-year cycles beginning in the year of the Passion and ending in the 420th year, in the year that will follow the consulship of Calepius and Arteburis. That consulship corresponds to AD 447. Since he was unable to name the consuls for 448, the author must have been writing in 447. If AD 448 was the 420th year, then the author's date for the passion was AD 29, the traditional Roman date. Fragments preserved from the beginning of the list and from the portion covering the years 365 through 388 show that the list included the lunar epact and the weekday for 1 January, followed by the date in the Roman calendar for the beginning of the Paschal month. The earliest date in the preserved fragments is 8 March. According to the preface, the list also included the date of Easter Sunday and notations at the appropriate year for the accession of the emperors and the Roman pontiffs. From the portion that is extant for the period from 365 to 388, Schwartz (1905: 71) deduced that the author used a twelfth-year *saltus*.

The second text to make the year of the Passion correspond to the beginning of the cycle is the work of the computist of 455 himself. The third is the Paschal table of Victorius of Aquitania, completed in 457. As we shall see, Victorius began his 532-year list with the year of the Passion, although that was not for him the first year of the 19-year cycle.

With his interval of 186 years between the Passion and the first year of a cycle, Augustalis does not attempt to make the two years correspond cyclically.

[15] Cramer 1826; for the text see Mommsen 1892: 503–10.

He does, however, recalibrate the 84-year cycle to bring the traditional Roman date for the Passion on 25 March into its first year as the 14th day of the moon. Thus he can claim that the first year of his cycle recapitulates the lunar data for the year of the Passion. That move is the first step in the process that we find completed in the fragments from Zeitz. An additional argument for dating Augustalis to the fifth century is the fact that his year of the Passion corresponds to AD 28. For that there is a parallel in the chronicle of Prosper, who numbered the consulship of Valentinianus VIII and Anthemius (AD 455) as the year 428 from the Passion (Mommsen 1892: 483).

The Carthaginian computist attributes to Augustalis a base-date corresponding to AD 213. This base-date need not imply that Augustalis composed his work within the first 84-year period after that date. The author of the Cologne prologue said (Krusch 1880: 235) that his 84-year cycle beginning in AD 383 was the continuation of a cycle that began in 299 and the third such cycle in all. This implies an original base-date in 215. The Carthaginian computist referred to the 'circles' of Augustalis. Elsewhere in the text, the author frequently uses the word 'circle' to mean a complete revolution of 84-years. If Augustalis composed three such circles or, like the Cologne prologue, designated the current circle as the third in a series, then AD 213 was the putative base-date of the cycle, but not the date of Augustalis himself.

It would be tempting to identify this Augustalis with the Gallic Augustalis whose saint's day is 7 September.[16] He is in turn likely the same Augustalis who was among the Gallic bishops to whom Leo addressed two of his letters. One (Letter 40) is dated 22 August in the consulship of Asturius and Protogenes, AD 449, the other (Letter 56) 5 May, in the consulship of Valentinian and Avienus, AD 450.

ii. The Computist of 243

Schwartz rejected the theory that Augustalis was the third-century inventor of what later became the Roman 84-year cycle. Schwartz nevertheless maintained (1905: 44) that the principles of an 84-year cycle originated in the third century. His only evidence for this claim, however, is the criticism levelled against 'certain of his predecessors' by the Pseudo-Cyprianic computist of 243 that they allowed the 14th day of the first month to range from the Ides of March to the Ides of April (*PL* 4. 945–6). Schwartz maintained that these were the limits used in the 84-year cycle. In fact, these limits follow from any computistical scheme that uses 1 January as the seat of the epact. The

[16] *Martyrologium incerti auctoris, PL* 30. 474 C.

epact 1 produces a 14th day of the moon on the Ides of April (13 April). As the epact advances, the date of the 14th moon recedes until the maximum epact of 30 produces a full moon on 15 March. Whether a computist will permit the Paschal full moon to fall as early as 15 March depends on the rules that apply for the date of Easter. Victorius says that the Roman tradition restricted the Paschal full moon to the period between 18 March and 15 April.

The limits between 15 March and 13 April of which the computist complains better fit the 8-year cycle of Hippolytus than the later 84-year cycle. In an 8-year cycle, no more than eight of the possible thirty epacts can appear. The cycle of Hippolytus begins with epact 1 and generates no epact larger than 27, which produces the Paschal full moon on 18 March. Nevertheless, 15 March is the theoretical limit.

Wilhelm Hartke (1956: 8–13) has indeed tried to show that the cycle of Hippolytus was itself based on an 84-year cycle, whose invention he attributes to Theophilus of Antioch in the middle of the second century. That argument relies on a numerological scheme for the epacts that both unnecessarily complicates the cycle of Hippolytus and has no basis in the evidence of the statue.

August Strobel anticipated Daniel McCarthy in believing that the Latin *Liber Anatolii de ratione Paschae* represents the authentic work of Anatolius of Laodicea. The reference in that text to an 84-year cycle therefore implies the existence of such a cycle by the third century.[17] As I have argued in Ch. 8, that text may well preserve some genuinely Anatolian material. There is, however, no evidence for the existence of this text in its present form before the time of St Columban.

iii. The 84-Year Cycle and Quartodecimanism

The lunar limits for Easter Sunday of 14–20 found in the Celtic tradition seem archaic, as does the insistence on not observing Easter before 25 or 26 March. For Krusch, these were survivals of the original version of the 84-year cycle devised by Augustalis.

Apart from Krusch's flawed reconstruction of the *laterculus* of Augustalis, there is no evidence that the Romans ever observed lunar limits of 14–20 or restricted Easter Sunday to no earlier than 25 March. Ideler (1825–6: i. 571), Schwartz (1905: 103), Strobel (1977: 233–324), and McCarthy (1994: 33), among others, have suggested that the peculiarities of the Celtic tradition are rooted in the Quartodecimanism of Asian Christianity.

[17] Strobel 1977: 160; McCarthy and Breen 2003: 73.

Epiphanius says that many Asian communities held the Paschal observance on the 14th day of the moon, regardless of the day of the week.[18] Irenaeus, who was originally from Asia Minor and became bishop of Lyons about 180, defended the antiquity of Quartodeciman tradition 'on behalf of the Christians of Gaul'.[19] The *Liber Anatolii* defends the Celtic practice of observing Easter Sunday as early as the 14th day of the moon by appeal to the ancient traditions of Asia.[20]

Christianity reached the British isles by the end of the third century, as is attested by the presence at the Council of Arles of bishops from Lincoln, London, and York.[21] Tertullian claims (*Adversus Iudaeos* 7. 4) that Spain and Britain, as well as Gaul, were already Christianized in his time (*c*.220). Schwartz suggested that Britain received missionaries directly from Asia Minor, rather than through Gallic intermediaries.

Ideler (1825–6: i. 571) maintained that the 84-year cycle arose early in Asian Christianity and came to Gaul and Britain with the first missionaries. Schwartz argued (1905: 103) that the Britons adapted the Roman 84-year cycle, whatever its origin, to serve a tradition in which the lunar limits of 14–20 were already well established.

Certainly the opponents of this Celtic tradition accused its practitioners of Quartodecimanism—falsely, as Bede pointed out *(HE* 3. 4. 17), for they always observed Easter on a Sunday. Any association between the lunar limits of 14–20 and Quartodecimanism is tenuous at best. The observance of Easter Sunday on moon 14 may simply derive from a time before the rule of postponement was established and before the Council of Nicaea had issued a prohibition against observing the Pasch 'with the Jews'. The Celtic churches may have adopted their rule prohibiting Easter before 26 March for the reasons that Columban suggests. March 25th was the traditional date of the equinox in the Roman calendar, and one ought not to observe the Passion before the equinox, nor Easter before the Passion.

Sulpicius Severus, a Gallic Christian himself, is certainly a good candidate for the authorship of the Celtic 84-year cycle. His decision to change the position of the *saltus* from the end of the twelfth year to the end of the fourteenth was both more logical arithmetically and perhaps symbolically appropriate for the lunar limit of 14. If McCarthy is right that the Gallic cycle had a base-date corresponding to AD 354, Severus perhaps chose that year not only in honour of St Martin, as McCarthy suggested, but also because

[18] Epiphanius, *Panarion* 50.1; ii. 246 Holl; ii. 24 Williams; see Ch. 3.
[19] Eusebius, *HE* 5. 20, 24.
[20] McCarthy and Breen 2003: 48–9, 66–7.
[21] *Ecclesiae Occidentalis Monumenta*, i. 381–95; S. N. Miller 1927.

in that year 25 March was a Friday. In the Roman calculation, 25 March was the 15th day of the moon and the 57th year of the cycle. By moving the *saltus* to the end of the 14th year, Severus changed the epact for the year from 21 to 22. He thereby put 25 March, the fourteenth day of the moon, at the head of the cycle.

iv. The Arguments of August Strobel

Like Ideler before him, August Strobel sought to find an Asian origin for the 84-year cycle itself. In an exhaustive discussion, Strobel brings a wealth of evidence to bear on the question. Three of his arguments in particular are worth examining.

The martyrdom of Polycarp and Pionius

According to the tradition, Pionius of Smyrna was martyred during the Decian persecution on the twelfth day of March. The consular date is partially corrupt. It is better read as the consulship of Decius II and Vettius Gratus, AD 250, than as Decius III and his son Decius Caesar, AD 251.[22] The tradition also reports that he was arrested 'on the second day of the sixth month, on the occasion of a great Sabbath, when the public places were crowded with both Jews and Greeks on holiday, and on the anniversary of the blessed martyr Polycarp'.[23]

The *Martyrdom of Polycarp* dates his death to the second day of the month of Xanthikos, seven days before the Kalends of March, on the occasion of the great Sabbath.[24] 23 February was a Saturday when Pionius died in AD 250. If 23 February was also a Saturday when Polycarp died, then the likely date was AD 166. In the *Ecclesiastical History* (4. 14), Eusebius reports the death of Polycarp during the reign of Marcus Aurelius (161–80). In the *Chronicle* (p. 205 Helm) the martyrdom of Polycarp appears in the 236th Olympiad, AD 165–9.

Taking the 'great Sabbath' as a reference to the first day of the Passover festival falling on a Saturday, Strobel (1977: 245–53) dates these events to Saturday, 22 February, of 167 and 251. He points out that there was an astronomical full moon on 22 February of 167. He suggests that the tradition could easily have miscalculated the calendar correspondences by one day. Either way, the interval between the two dates is 84 years. For Strobel, that interval suggests that an 84-year Paschal cycle was in use at least by the latter part of the third century.

We do not know what the author of these texts meant by a 'great Sabbath'. The Gospel of John (19: 31) refers to the day of the crucifixion as preceding a Sabbath that was 'a great day', by which he probably means only that the Passover coincided with a Saturday. In the Jewish tradition, the 'Shabbat Ha-Gadol' is

[22] Barnes 1968: 529–31. [23] *Martyrium Pionii* 2, 23. [24] *Martyrium Polycarpi* 21.

the Saturday before Passover. In the later tradition of the Greek church, the 'great Sabbath' is the day before Easter, a usage first attested by John Chrysostom (*PG* 55. 519). A date in February does not fit either tradition. P. Brind'Amour (1980) has taken the phrase as referring to Sunday, the 'Christian Sabbath'—claiming, as have others before him, that Epiphanius (*Panarion*, iii. 325 Holl) uses the term in that sense. As P. Devos (1990) has rightly argued, however, the contrast that Epiphanius makes here and more explicitly elsewhere in his works is between the 'small Sabbath rest' of the Mosaic Law and the 'great Sabbath rest' of Christ. G. W. Bowersock (1995: 82–4) has suggested that the 'great Sabbath' is a reference to a period of preparation for Easter, similar to the later Lenten fast, and therefore designates an interval of time, not a specific day of the week. W. Rordorf (1980) has argued that Saturday, 23 February was 'great' because it coincided with the Roman holiday of the Terminalia. Bowersock points out that the context requires a period when both Jews and pagans were on holiday. Rordorf's suggestion meets that requirement, but we do not know that the Roman Terminalia had any place in the festival calendar of Smyrna. Jews should not have been crowding the marketplace on a Sabbath, anyway, great or otherwise. The assimilation between the dates for the martydoms of Polycarp and Pionius is at least partly the result of hagiographical fabrication.

Schwartz (1905: 128–38) challenged the veracity of Eusebius' date in the 160s. The *Martyrdom of Polycarp* does not give a consular date, but it does name Statius Quadratus as Proconsul of Asia at the time. The consular lists have his name for the year 142. Aelius Aristides refers to a man named 'Kodratus' as his friend and sometime proconsul of Asia.[25] Schwartz argues from the biography of Aristides that the date must be in the 150s. For Schwartz, the 'great Sabbath' is a reference to the Quartodeciman observance on the 14th day of the moon. He notes that there was an astronomical full moon on 24 February, AD 156 and concluded that Polycarp was martyred on Saturday, 22 February AD 156.

That the author of these texts meant 'Sabbath' in the sense of 'Saturday' is the most plausible understanding of the narrative, whatever he might have meant by calling it 'great'. The fact that Eusebius dates the martyrdom of Polycarp to the 236th Olympiad makes it more than likely that Saturday, 23 February AD 166, was the date carried in the tradition.

It is possible that 23 February 166 and 12 March 250 are the historically correct dates for the martyrdom of Polycarp and Pionius. In that case, the 84-year interval is no more than coincidence. If the tradition was partially constructed, with the date in 166 generated from a known date in 250, that calculation would attest only to knowledge of the 28-year cycle of weekdays, not to the existence of an 84-year Paschal cycle.

[25] *Hieros Logos* 4, pp. 336, 338 Jebb.

The base-date of AD *46*

The Roman 84-year cycle has a base-date in AD 298, which corresponds cyclically to AD 46. Strobel (1977: 281–301) connects this date with a tradition attested by Irenaeus (2. 22. 6) that Jesus was in his 40s during the last years of his ministry. Irenaeus comes to that conclusion from a passage in the fourth Gospel (John 8: 57), where the people say to Jesus, 'You are not yet fifty years old and you have seen Abraham!' There is also the statement at John 2: 20: 'it has taken forty-six years to build this temple, and you are going to raise it in three days?' In his commentary on the passage (*In Joannis evangelium* 10. 11–12), St Augustine explains that the 46 years it took to build the temple is a symbol of Jesus as the second Adam. In Greek, he says, the letter a represents the number 1, d the number 4, and m the number 40, so $1+4+1+40=46$.

Strobel argues that the tradition known to Irenaeus took the passage as a statement of Jesus' age at the time of the conversation. Because Irenaeus was from Asia, Strobel suggests that the 84-year cycle arose among the Quartodeciman communities of Asia where such a tradition might have been accepted.

Strobel cites several texts that date Pontius Pilate or the crucifixion to the reign of Claudius. He also draws attention to a passage in the Ambrosian Easter-Table where the baptism of Jesus is dated to the consulship of Valerius Asiaticus, AD 46. That there is any connection between these aberrant dates and the 84-year cycle is dubious.

The 'Jewish' 84-year cycle of Epiphanius

Finally, Strobel discusses at some length a problematic passage in the *Panarion* of Epiphanius of Salamis, written in the 370s, where Epiphanius seems to attribute an 84-year cycle to the Jews. The passage appears in the section refuting those who refused to accept the Gospel of John. Epiphanius refers to them as the 'alogoi', people who deny the Logos-Christology of the fourth Gospel. Epiphanius discusses how the four Gospels complement one another without error. The discussion includes an extensive excursus on the chronology of the life of Christ. Epiphanius dates the Passion to Friday, 20 March, the 14th day of the moon, in the 18th year of the emperor Tiberius and the consulship of Vinicius and Longinus.[26] March 20th was a Friday in AD 33, but the consulship of Vinicius and Longinus corresponds to AD 30. The 18th year of Tiberius was AD 31/32, if counted from his accession in August of AD 14. Those chronological discrepancies are not of concern here.

In the immediately relevant passage, Epiphanius claims that the Jews ate the Passover two days too early. Here Epiphanius accepts an interpretation of

[26] Epiphanius, *Panarion* 51. 23; ii. 292 Holl, ii. 54 Williams.

Matthew 26: 2 that appears also in the *Didascalia Apostolorum*.[27] The latter is a third-century text, extant only in a Syriac version and some Latin fragments, purporting to be the teachings of the twelve Apostles.

At Matthew 26: 2, Jesus is reported to have said to his disciples, 'You know that after two days the Passover is coming, and the Son of Man will be delivered up to be crucified.' At Matthew 26: 17, Jesus instructs his disciples to prepare the Passover meal, and at Matthew 26: 20 he is seated at table with the Twelve. The narrative does not explicitly state that a day or two has intervened in the meantime. Epiphanius, like the author of the *Didascalia*, understands the Last Supper to have taken place on Tuesday evening. According to the *Didascalia*, the Jewish authorities deliberately accelerated the observance of Passover by three days. Epiphanius says that Jesus knew the true date of the Passover, but that he and his disciples, along with the rest of the community, ate the Passover two days earlier, because the authorities made an error in the calculation of the 14th day of Nisan. Whether the *Didascalia* and Epiphanius are right on this matter is another question. Annie Jaubert argued in favour of the historicity of this tradition, but most scholars have rejected it as a secondary development based on fasting practices in certain churches.[28]

Epiphanius tries to explain how the Jewish authorities made this two-day error in fixing the date of the 14th day of the first month. He says that they add four double hours per year to the moon's course of 354 days, making a full day every three years. Epiphanius continues as follows:

> And so they intercalate five months in fourteen years, because the one double hour is subtracted from the sun's course of 365 days and three double hours; for, with the hours added, the final result is 365 days less one double hour. And so, because they multiply the fourteen years by six every eighty-four years, they intercalate one month in the eighty-fifth year, so that there are thirty-one <intercalary> months every eighty-five years; but by exact reckoning there ought to be thirty-one months, twenty-four days, and three double hours. (Epiphanius, *Panarion* 51. 26; ii. 297 Holl; translation Williams ii. 58–9.)

Where the translation reads 'double hours', the Greek text has simply 'hours'. The hours must be doubled in order to make the arithmetic work. The notion of a double hour derives from the Babylonian astronomers, who divided the day into twelve parts.[29] The addition of one-third of a day to the

[27] Epiphanius, *Panarion* 51. 26; ii. 296 Holl, ii. 57 Williams; *Didascalia* 21. 13, 17: 181, 187 Connolly.

[28] Jaubert 1965: 69–76; for criticism see Meier 1991: 390–5.

[29] Herodotus 2. 109; Ginzel 1906–14: i. 80.

lunar year requires eight hours or four double hours. The addition of one-quarter of a day to the solar year is six hours or three double hours. Even so, the relationship between these double hours and the intercalation of five months every fourteen years is unclear, as is the reason for subtracting a double hour from the course of the sun. The text may be corrupt.

Strobel (1977: 311) explains Epiphanius' reasoning as follows. There are 31,046 days and three double hours in 85 solar years. In 85 lunar years of 354 days there are 30,090 days, to which must be added thirty-one embolismic months of 30 days each for a total of 31,020. The sum is short by 26 days and three double hours. The text reads 24 days in one manuscript, 21 in another. Strobel believes the original reading was 26. He then adds six additional lunar days—one *saltus lunae* for each 14-year interval—for a total of 32 days and three-double hours. Subtracting 30 days for an embolismic month, Strobel is left with an excess of two days and three double hours. Those, Strobel says, are the two days that, according to Epiphanius, account for the error of the Jews in calculating the days of the moon in the year of the Passion.

Epiphanius cannot, in Strobel's view (1977: 310, 324), have invented this calculation. He must have received the idea of an 84-year cycle with six 14-year divisions from Jewish or Jewish-Christian sources. Such a cycle derives from the same source as the 84-year period with a 14th-year *saltus* that Strobel believes, following Krusch, was the original form of the Roman cycle. That source, according to Strobel, was a Quartodeciman community of Asia Minor or Syria.

Strobel's attempt to connect the 14-year intercalary period of the Jews with the supposed 14th-year *saltus* of the original Roman 84-year cycle has no foundation in the text. The intercalation of five months every fourteen years has nothing to do with the insertion of a *saltus*. Such an embolismic system results rather from the addition of one-third of a day to the lunar year. In fourteen years, the annual differential in the epact of 11¼ days amounts to 157½ days. It is therefore necessary to add 157 days to the course of the moon, with one-half day left over. Five intercalary months account for 150 of those days, and three days are added for the three Julian leap days in that period. The remaining four days result from the addition of one-third of a day to the lunar year, with one whole day intercalated every three years. We are left after fourteen years with one-half of a solar leap day and two-thirds of a lunar leap day. The difference between them is four hours, or two double hours. It may be this differential to which Epiphanius refers when he speaks of subtracting a double hour from the solar year, although the arithmetic does not match the text as it stands.

Epiphanius says that this 14-year cycle results in the intercalation of 30 months over the period of 84 years. A 31st month, he says, is added in the 85th year; but after 85 years there ought to be 31 intercalary months and either 21 or 24 days, according to the manuscripts. Epiphanius apparently believes that there ought to be 31 intercalary months in 84 years, not thirty. In this, he is correct, if the length of the lunar year is 354 days.

We can make some sense of the passage as follows. In 84 solar years there are 30,681 days. In 84 lunar years of 354 days each, there are 29,736 days. The difference is 945 days, or 31 embolismic months and 15 days. Thus, 84 solar years consists of 84 lunar years, 31 embolismic months, and 15 days. The 85th solar year will add one lunar year and 11¼ days for a total of 85 lunar years, 31 embolismic months, 26 days, and three double hours. If the Jews begin a new month when, according to Epiphanius, the moon is only in its 27th day, then they will count what is really the eleventh or twelfth day of the moon as the fourteenth.

What exactly Epiphanius meant to say in this passage is beyond recovery from the text as the manuscripts present it. It is clear, however, that the essential disagreement between Epiphanius and what he believes to be the reckoning of the Jews is the addition of one-third of a day to the lunar year, requiring the intercalation of a lunar leap day every three years. This increment has no relationship to the principles of the 84-year cycle in use at Rome. There are, however, some interesting parallels in Jewish sources.

The addition of one-third of a day approximates, in simple fractions, the length of the lunar year in the later Jewish calendar, expressed as 29 days, eight hours, and 876 parts. The tractate *Rosh Hashanah* (25a) attributes to Rabbi Gamaliel II the saying that according to a tradition he learned from his grandfather, 'the consecration of the moon cannot take place at a period less than twenty-nine and a half days, two-thirds of an hour and seventy-three parts'. This reference to the later medieval parts of an hour has no parallel in Talmudic literature. Scholars therefore believe that the passage has been at least partly interpolated.[30] The passage must originally have read '29 days', the minimum length of a month in a lunar calendar, or 'twenty-nine and a half days', consistent with a lunar year of 354 days, or perhaps the fractional 'two-thirds of an hour' belongs to the original text, but without the additional 73 parts. In the last case, the passage attests to a relatively early tradition that the lunar year consisted of 354 days and eight hours, as in the passage from Epiphanius. The tractate *Arachin* (9b) quotes Ravina, the fifth-century editor of the Talmud, as stating that one day should be added every three years to the regular alternation of 29 and 30-day months and another day every 30 years.[31] The last phrase is considered an interpolation, but the addition of one day every three years may be genuine. Otherwise, the earliest reference to a lunar

[30] Stern 2001: 201–4; Belenkiy 2002.
[31] Stern 1996: 126; 2001: 203; Belenkiy 2002.

year of 354 and one-third days appears in a fragment of a *Piyyut* (liturgical poem) attributed to the seventh-century poet Rabbi Eleazar Ha-Qalir.[32] The author of the *Baraita d'Shemuel*, writing shortly after AD 776, calculates the lunar month as equivalent to 29½ days plus two-thirds of an hour, and he uses the terminology of 'large hours' in his calculations.[33] It is possible that the text contains genuine elements of the teachings of Shemuel Yarkhinai, who was head of the Talmudic academy at Nahardea, near Babylon, in the third century.

The intercalary period of 14 years has no parallel in Jewish sources. An 84-year cycle does appear, however, in the *Pirkei Rabbi Eliezer*—an eighth-century text that includes a biography of Rabbi Eliezer ben Hyrcanus and what purports to be his teachings on the books of Genesis and Exodus. Eliezer ben Hyrcanus was a contemporary of Gamaliel II and one of the great teachers of the late first and early second century AD.

In commenting on the creation of the sun and the moon on the fourth day of the week, the author discusses lunar and solar cycles. He says that the new moon is not visible until eight 'large hours', defining a large hour as the equivalent of two ordinary hours. A lunar month consists of 708 hours and 40 minutes, a lunar year 8504 hours (p. 48 Friedlander). These values are equivalent to 29½ days plus two-thirds of an hour per lunation and 354 days plus one-third of a day in a lunar year. Elsewhere (p. 43), however, the text defines a lunar month as containing 29½ days, 40 minutes, and 73 parts—the same value as in the fully developed medieval Jewish calendar. The author also (p. 57) advocates the use of a 19-year cycle with seven embolismic months. Meir Bar-Ilan (2004) has therefore suggested that the author is 'a good candidate for the founder of the Jewish calendar'.

The *Pirkei Rabbi Eliezer* mentions three kinds of 'great cycle'. The great cycle of the sun is 28 years, with seven lesser cycles of four years each (p. 34). The great cycle of the moon is 21 years, with seven small cycles each containing three years (p. 43).

The lesser cycles of the sun refer to the four-year period after which an additional solar day must be intercalated. The lesser cycles of the moon would correspond to the intercalation of an additional lunar day every three years.

The author also says (p. 49) that in three cycles of the sun and four cycles of the moon, there are 84 years, which are 'one hour of the day of the Holy One'. This equation is apparently an explanation of the saying in Psalm 90: 4 that 'a thousand years in thy sight are but as yesterday'. Twelve periods of 84 are 1008

[32] Schmelzer 1996: 135–7; I owe the reference to Bar-Ilan 2004; my colleague David Goodblatt kindly provided me with an English translation of the relevant passage.

[33] Stern 1996: 118–25.

years, and twelve large hours of God constitute one day. Thus one hour of God is approximately 84 years.

Strobel (1977: 447) cites the passage as further evidence for the use of an 84-year lunisolar cycle among the Jews. The author uses a 19-year lunisolar cycle, however; and his 84-year period is unrelated either to the 14-year intercalary period that Epiphanius mentions or to the Roman 84-year cycle with its thirty-one embolismic months.

The Jewish calendar evolved incrementally over a period of several hundred years. As a native of Palestine and a contemporary of Hillel II, the putative inventor of the Jewish calendar, Epiphanius may well have known of such experimentation with the calendar as the intercalation of a lunar leap day every three years. He may also have learned of something like the 21-year 'great cycle of the moon' mentioned in the *Pirkei Rabbi Eliezer* and the corresponding 84-year period that constitutes one hour in the divine perspective. The otherwise unattested fourteen-year period for the intercalation of five embolismic months may be his own invention. Whatever the source of his complaints about the Jewish calendar, they have no relevance to the origins of the 84-year cycle used at Rome or among the Celts.

v. Conclusion

Even in the aggregate, the arguments of Krusch, Schwartz, Hartke, Strobel, and others for the antiquity of the 84-year cycle fail to convince. The earliest direct evidence for such a cycle appears in the consular list of the *Chronograph of 354*. The reference of Paschasinus to the year corresponding to AD 444 as the 63rd year of the Roman calculation shows that the cycle had a base-date corresponding to AD 382. The Cologne preface and the prefaces of the Ambrosian table and of the 84-year list in the Vatican manuscript all attest to a cycle beginning in AD 298. The evidence of the *Chronograph of 354* is consistent with a cycle beginning from that date. The form of the cycle, with its seven columns of twelve years each, is reminiscent of the Hippolytan cycle organized in seven columns of sixteen years each.

The *supputatio Romana* is best understood as having arisen shortly after AD 298 under the influence of the Anatolian 19-year cycle and as a Roman response to it. The 84-year cycle represents a compromise between the 95-year period of Anatolius and the 28-year solar cycle of weekdays. The Romans accepted the Alexandrian rule that Easter Sunday should be observed only after the equinox, as well as the Alexandrian date for the equinox on

21 March, although they rejected the rule that the Paschal full moon should not precede the equinox. I have argued that the cycle of Anatolius had its *saltus* at the end of the eleventh year, with the additional day appearing in the epact for the twelfth year. The Roman cycle accepted that approximate position, but moved it to the end of the twelfth year to fit the division of the cycle into seven twelve-year columns, as well as to meet the arithmetical requirements of an 84-year cycle. While influenced by the cycle of Anatolius, the Romans nevertheless retained the date of 21 April as the upper limit for Easter Sunday and the now traditional lunar limits of Hippolytus—the Paschal full moon falls as early as 18 March and Easter Sunday is normally limited to the period between the 16th and the 22nd day of the moon.

The choice of the year corresponding to AD 298 as the base-date for the new cycle was dictated by the Roman calendar. The Hippolytan cycle had begun with a Paschal new moon on 13 April, in the year corresponding to 222, so that the cycle began with epact 1 as of 1 January. The 84-year cycle retained epact 1 and 13 April at its head. One possible choice for the new base-date would therefore have been 84 years later in 306. By the rules of the 19-year cycle, however, the Hippolytan date should repeat in 298 and 317. Perhaps the choice of 298, rather than 306, was a compromise between Alexandrian and Roman methods. The Alexandrian calculation produces a 14th day of the moon on 12 April in the year 298, in both the Anatolian and the classical cycles.

The origin of the Celtic 84-year cycle with its *saltus* at intervals of fourteen years is problematic. Daniel McCarthy may well be right in attributing it to Sulpicius Severus at the beginning of the fifth century. Severus revived neither the genuine lunar calculations of Anatolius nor the cycle of Augustalis. The work of Sulpicius Severus—or whoever is responsible for this revision—was an attempt to improve upon the Roman 84-year cycle, while adapting it to the peculiar traditions of Gallic Christianity.

4. THE PASCHAL CYCLE OF VICTORIUS OF AQUITANIA

The disputes over the Easter dates for 444 and 455 prompted Leo's archdeacon Hilarus, who succeeded Leo as Pope in 461, to request a thorough investigation of Paschal calculations. Hilarus entrusted the task to a man named Victorius, apparently well known at the time for mathematical skill. A copy of the letter of Hilarus to Victorius is included with the text of Victorius' report.

The best modern edition is that of Bruno Krusch (1938: 16–52). The 1892 edition of Theodor Mommsen (1892: 669–835) is more readily accessible, both in university libraries and through the website of the *Monumenta Germaniae Historica* (http://www.dmgh.de/).

Gennadius of Marseilles, a younger contemporary, says of Victorius (*de viris illustribus* 88) that he was an Aquitanian and 'a scrupulous calculator', who composed a 532-year Paschal cycle at the invitation of Hilarus. Mommsen (1892: 669) identified Victorius with the author of the *Liber Calculi* once thought to have been a work of Bede, but attributed in a Berlin manuscript to 'Victorius'.

Victorius reported back to Hilarus in the year that he designates as the consulship of Constantinus and Rufus, when 1 January was a Tuesday and Easter Sunday was on 31 March. That year corresponds to AD 457. In his prefatory letter to Hilarus (Krusch 1938: 17–26; Mommsen 1892: 677–84), Victorius explains the various reasons for the discrepancies between Alexandrian and Roman calculations. He says he decided that the 19-year cycle of the Alexandrians yields the best lunar calculations. Using the 19-year cycle, he made calculations to ascertain whether the present year, with the 14th day of the moon on Monday, 25 March, was consistent with the traditional date for the creation on Sunday, 25 March, and the creation of the moon therefore on Wednesday, 28 March, being full and in its fourteenth day. He also checked on the date of the first Passover at the time of the Exodus. To make the calculations, Victorius says that he followed the chronology in the *Chronicle* of Eusebius as translated by Jerome and continued by both Jerome and Prosper. He found that the present year is the year 5658 from creation and that the first Passover was on Friday, 25 March, at the beginning of the year 3690. Finally, he calculated the data for the year of the Passion at the traditional Roman date in the consulship of the two Gemini and generated a 14th day of the moon beginning in the evening on Thursday, 25 March, consistent with the narrative of the Gospels, at the beginning of the year 5229. The consulship of Fufius Geminus and Rubellius Geminus corresponds correctly to AD 29. Victorius' data, however, correspond to the year 28, because he used the defective version of the consular list included in the chronicle of Prosper (see Ch. 2).

Having satisfied himself of the accuracy of the 19-year cycle, Victorius proceeded to generate a Paschal list (see Table 10). He tells Hilarus that it would be more work than it is worth to compose a complete list from the year 1 of the world. He therefore decided to limit the task to a 532-year list beginning from the year of the Passion. Such a list, he says, constitutes a perpetual calendar, because it returns to its starting point after 532 years. Franz Rühl (1897: 126) suggested that Victorius knew of the 532-year period from Annianus. Bartholomew Mac Carthy (1901: lxxxv) refuted that argument, claiming that Victorius was unacquainted with the 28-year solar cycle and that his 532-year period consisted of four units of 133 years. C. W. Jones argued that Victorius discovered the cycle empirically and accidentally, failing to understand the reason that the data for Easter should repeat in a 532-year period.[34]

It is indeed unlikely that Victorius knew of Annianus. It is also true that Victorius does not in his letter to Hilarus explain the 532-year period or mention the 28-year cycle of weekdays. It does not follow, however, that Victorius was ignorant of the 28-year period. He must have realized that the 112-year cycle of Hippolytus and the 84-year cycle that replaced it were both based on a 28-year period for the cycle of weekdays. As a 'scrupulous calculator', he could easily have figured out that $28 \times 19 = 532$.

At the end of the prefatory letter, Victorius draws Hilarus' attention to double dates for Easter Sunday in some years of the list. He decided not to take it upon himself to decide whether Easter should be observed on the 15th day of the moon, contrary to Roman tradition, or be postponed a week to the 22nd day of the moon, contrary to Alexandrian tradition. In such cases he has noted both alternatives and left it to the Pontiff to make the decision. He also alerted Hilarus to the problem that arises in years when 1 January falls on a Saturday and the 27th day of the moon. When such a year is not also a leap year, the fourteenth day of the moon falls either on Friday, 18 March, or on Sunday, 17 April. The resulting Easter dates on 20 March or on 24 April are both problematic.

There are a few other double dates in Victorius' list, to which he does not explicitly draw attention in the prefatory letter, except to state that they represent variant opinions. Most of these entries relate to cases where Victorius' calculations produce an Easter date during the period between 21 and 24 April. The alternative is a date in March that would be possible under the old Roman rules permitting a 14th day of the moon as early as 18 March.

Victorius adopted the 19-year cycle and, following the precedent of the 84-year cycle, he also adopted the Alexandrian date of 22 March as the earliest permissible date for Easter. He preferred, however, to retain the old Roman tradition of limiting Easter to the period between the 16th and the 22nd day of the moon, rather than the 15th through the 21st as in the Alexandrian tables.

Victorius' *saltus* appears between epact 4 and epact 16 at a year that corresponds to the seventh of an Alexandrian cycle. The reason for this, ironically, is that Victorius adopted the Alexandrian practice of placing the *saltus* at the end of the 19-year cycle—a feature that he specifically approves in his prefatory letter (Krusch 1938: 19). He thought the 19-year cycle should begin at creation, with the 14th day of the moon rising in the evening on 28 March, with a tabular date of 29 March. He calculated the year of the Passion as 5229, corresponding to AD 28, with the 14th day of the moon rising in the

[34] Jones 1935: 409; 1943: 63–5; cf. Wallis 1999: li.

Table 10. The 19-year cycle of Victorius, compared with the Alexandrian cycle
Adapted from Schwartz 1905: 74. The epact is shown as of 1 January

Victorius			Alexandrian		
Cycle	Epact	Moon 14	Cycle	Epact	Moon 14
1	16	29 March	7	15	30 March
2	27	17 April	8	26	18 April
3	8	6 April	9	7	7 April
4	19	26 March	10	18	27 March
5	30	14 April	11	29	15 April
6	11	3 April	12	10	4 April
7	22	23 March	13	21	24 March
8	3	11 April	14	2	12 April
9	14	31 March	15	13	1 April
10	25	20 March	16	24	21 March
11	6	8 April	17	5	9 April
12	17	28 March	18	16	29 March
13	28	16 April	19	27	17 April
14	9	5 April	1	9	5 April
15	20	25 March	2	20	25 March
16	1	13 April	3	1	13 April
17	12	2 April	4	12	2 April
18	23	22 March	5	23	22 March
19	4	10 April	6	4	10 April

evening on Thursday, 25 March and having a tabular date of 26 March. The number 5229 is divisible by 19 with a remainder of 4. Therefore, the first year of his 19-year cycle corresponds to AD 25, with epact = 16 as of 1 January. Advancing in 11-day increments, the epact is 4 in the last year of the cycle. Since Victorius began his list with the year corresponding to AD 28, the *saltus* actually appears between the 16th and the 17th year.[35]

The result of this decision is that Victorius' dates for the 14th day of the moon agree with the Alexandrian dates only for the years corresponding to 1–6 of the Alexandrian cycle, 14–19 of his own cycle, 11–16 in his list. Even when the difference of one day in the date of the Paschal full moon does not produce a different date for Easter, it does result in a different numbering of the moon for Easter Sunday. Hence questions could arise such as that mentioned in the correspondence between Boniface and Dionysius Exiguus,

[35] For further discussion of Victorius' methods see Mac Carthy 1901: lxxxiii–xcii; Schwartz 1905: 73–80; Jones 1943: 61–5; Holford-Strevens 1999: 808–9; Wallis 1999: l–lii; Declercq 2000: 82–95; on the later history of the Victorian table, see Krusch 1884; Jones 1935.

as to whether Easter Sunday on 19 April in AD 526 was the 21st or the 22nd day of the moon (see Ch. 4).

Victorius' 532-year list has seven columns: (i) the number of the year beginning with the year of the Passion (AD 28) as 1 and continuing through 532; (ii) the names of the consuls; (iii) a numeral from 1 to 7 indicating the weekday of 1 January; (iv) the epact of the moon as of 1 January; (v) the date of Easter Sunday; (vi) the epact of the moon on Easter Sunday; and (vii) a space for entering alternative dates or other notes. The date of the Paschal full moon does not actually appear, but it is easily inferred from the moon of Easter Sunday. Table 10 compares the epact and 14th moon in the 19-year cycle of Victorius with the classical Alexandrian cycle.

Victorius' 532-year list of epacts, weekdays, and Easter Sundays represents both a technically accurate use of the 19-year cycle and a reasonable compromise between Alexandrian and Roman traditions. It could not, however, succeed in eliminating disagreements between Rome and Alexandria except in the unlikely event that Leo or Hilarus could persuade both the Alexandrians and the other churches of the eastern empire to abandon their various versions of the Anatolian tables. The tone of the letter from Proterius to Leo on the subject of Easter for 455 shows how futile such an effort would be. Proterius informs his Roman colleague that the Alexandrian church is the mother of Paschal calculations and its diligence in such matters beyond reproach (Krusch 1880: 270–1).

The Victorian table seems to have been endorsed by Leo, Hilarus, and their successors. Indeed, a council of Gallic bishops meeting at Orleans in 541 adopted a resolution that 'the Holy Pasch should be celebrated at the same time by all bishops and priests in accordance with the list of Victorius'.[36] Nevertheless, even in the western empire it never entirely supplanted the authentic Alexandrian cycle that was circulating under the names of Theophilus and Cyril. When therefore that table was about to expire, Dionysius Exiguus was commissioned in the 520s AD to draft a continuation. The calculations of Victor were often regarded with disdain. St Columban, in his letter to Pope Gregory (Letter 1, pp. 4, 6 Walker) on the subject of whether Easter should be observed as late as the 22nd day of the moon, accuses Victorius of perpetuating this error and characterizes his work in general as worthy more of laughter than authority. Without mentioning his name, Dionysius Exiguus in his letter to Petronius refers scornfully to 'certain people' who calculate the wrong dates for the 14th day of the moon (Krusch 1938: 66). In the letter to Boniface, he refers to those who 'calculate the moon other than in accordance with the truth' (Krusch 1938: 84–5).

[36] *Concilia aevi Merovingici*, 87.

St Bede (*DTR* 51) quoted with approval a letter of Victor of Capua, written about 550, in which the Capuan bishop accused 'a certain Victorius' of incompetence and demanded that his Paschal list be stripped of all authority. Bede's endorsement and 532-year continuation of the table of Dionysius Exiguus drove the Victorian tables out of circulation.

12

Paschal Calculations in the Eastern Empire

St Maximus the Confessor, member of a distinguished family in Constantinople, wrote a treatise on Paschal calculation in a year that he designates as the 31st year of the emperor Heraclius, the 14th year of an Indiction, and the year 6133 from Adam (*PG* 19. 1233). Heraclius became emperor in October of 610.[1] The 31st year of Heraclius corresponds to 640/1, which was indeed a 14th indictional year.

Maximus advocates what he calls 'the ecclesiastical system' of Paschal reckoning (*PG* 19. 1234). He does not name its author, but it is clear that Maximus follows the cosmic era and Paschal cycle of Annianus. If 640/1 was the cosmic year 6133, the year 1 for Maximus agrees with that of Annianus, corresponding to 5493/2 BC (see Ch. 10).

How long before the time of Maximus this cycle became so firmly established in the Byzantine empire we do not know. The earliest evidence for the use of the cosmic era of Annianus dates from the 550s, in the monastic biographies of Cyril of Scythopolis (*vita Sabae*, p. 183 Schwartz). Between the time of Annianus and that of Cyril, another cycle remained in use in the eastern empire, which retained the base-date of the cycle of Anatolius.

In the space reserved for alternative dates and other notes in the Paschal table of Victorius, there is an entry at the year 326 from the Passion, corresponding to AD 353: *Initium paschalis Grecorum seu Machedonum post annos XCV*, 'Beginning of the Paschal <list> of the Greeks or Macedonians after 95 years' (Krusch 1938: 42). Two similar entries note the beginning and end of the Paschal list of Theophilus, at the years corresponding to AD 380 and 480 (Krusch 1937: 44, 49).

This note at the year 353 is one of several reasons for concluding that Anatolius composed a 95-year Paschal cycle beginning in 258 and ending in 352 (see Ch. 8). The list that Victorius knew was a continuation beginning 'after 95 years'. His note constitutes the sum of what we learn from Greek or Latin sources about a continuation of the Anatolian 95-year list after its expiration in 352.

[1] *Chronicon Paschale* 701. 11–702. 1; Theophanes 298–9 de Boor.

1. THE PASCHAL CANON OF ANDREAS OF BYZANTIUM

i. The Armenian Tradition

From Armenian sources we learn the name of its author and a few details about what must be the same Paschal list that Victorius mentions at the year 353. Armenian sources express dates by reference to a national era, the first year of which followed upon the end of a 200-year list of dates for the Paschal full moon attributed to one Andreas. As we shall see, that list ended with a 14th day of the moon on 25 March of the year corresponding to AD 552. The Armenians used a calendar of 365 days similar to the Egyptian 'mobile' calendar (Ginzel 1906–14: iii. 314–18). There were 12 months of 30 days each, followed by 5 additional days. Therefore, a date in the Armenian calendar recedes by one day with respect to the Julian calendar every fourth year. Similarly, a fixed date in the Julian calendar, such as Epiphany on 6 January, will advance by one day every fourth year with respect to the Armenian calendar. The sources say that in the first year of the Armenian era the date of Epiphany was 30 Arats (Dulaurier 1859: 102–3). From that synchronism between 6 January and the 30th day of the 6th month, it follows that the first day of the first month corresponded to 11 July. The names of the months and their correspondences in the first year of the Armenian era are as follows. Here and throughout the discussion I follow Agop Hacikyan (2005) for the spelling of Armenian names. The system is based on the standard established by the editorial board of *The Armenian Review*. It uses the phonetic values of classical and eastern Armenian, and it omits the use of diacritical marks (Hacikyan 2005: ii. 25):

Navasard	11 July AD 552
Hori	10 August
Sahmi	9 September
Tre	9 October
Kaghots	8 November
Arats	8 December
Mehekan	7 January AD 553
Areg	6 February
Ahekan	8 March
Mareri	7 April
Margats	7 May
Hrotits	6 June
Avelyats	6–10 July

As we shall see, the Armenian patriarch Anastasius attempted to introduce a fixed calendar in the seventh century, but died before accomplishing the objective. The mobile calendar remained in use, and the first day of Navasard continued to recede with respect to the Julian calendar by one day every four years. By the ninth century, 1 Navasard had entered into the Easter season, so that it was possible for Easter to be observed twice within the same Armenian year and not at all in another. This seems to have caused little consternation. The tenth-century historian Movses Kaghankatvatsi notes at the year 347 of the Armenian era that 1 Navasard coincided with Easter Sunday (Dulaurier 1859: 8). That date must have been 16 April 898. In the following year Easter would have been 1 April, corresponding to 21 Hrotits of the same Armenian year 347. Yet Movses notes only that 347 was the year when Abou-Ali was murdered by his brother Sempad, making no comment about the coincidence of Easter with the first day of the year.

In the Armenian year 453, 1 Navasard coincided with 20 March, the Armenian date of the equinox. Nevertheless, it was not until the end of the eleventh century that John the Deacon (Hovhannes Sarkavag Imastaser) introduced a fixed calendar with a leap-year intercalation.[2] He began a new numbering of the years, with 1 Navasard of the new year 1 fixed on 11 August of AD 1084—532 years after the beginning of the Armenian era. Thereafter, some sources express dates both by what they now call the 'great era', and the 'small era' (Dulaurier 1859: 114). The Armenians continued to use the mobile calendar and the 'great era' into modern times (Dulaurier 1859: 8–9).

Samuel of Ani composed a continuation of the *Chronicle* of Eusebius, beginning from the year 1 of Christ and ending at the year that Samuel numbers 1179 since Christ and 626 of the Armenian era. At the year 353, Samuel notes the 'beginning of what is called the 200-year cycle of Andreas'. Two hundred years later, at the year 553 from Christ, the third year of the Armenian patriarch Moses, Samuel has an extensive note, as follows:

> Here the year 553 after the birth of Christ ended at which time also the 200-year cycle of Andreas ended. From this point forward the era of the Armenians begins, for the following reason. The last full moon of the 200-year cycle was on 25 March, but the beginning of the cycle was 4 April. It was not possible to extend the cycle forward, because the next year's full moon after 25 March should have been 13 April. Thus all the festivals and all the rules of the calendar were disturbed. Accordingly the wise men of the time met in council and established an Armenian era on the basis of which the Paschal festival of the Lord and all of the rest should be regulated. But since nine years had passed before they established the rule, it was in the tenth year that a certain Aeas, a brilliant man, with the help of other men of great intellect, established the cycle of

[2] Dulaurier 1859: 112–14; Ginzel 1906–14: iii. 319; Grumel 1958: 143.

500 years. This is the origin of the Armenian era, which we henceforward number in the table of our chronicle. (*PG* 19. 683–4.)

As we shall see, the date of the Paschal full moon on 25 March corresponds to AD 552. The numbering of years from Christ in the chronicle of Samuel and other Armenian texts is discussed in Ch. 18.

Kirakos of Gandzak (Ganca in Azerbaijan) tells much the same story. Kirakos wrote a history of Armenia from earliest times to the Armenian year 714, AD 1265. The relevant text, in the translation of Robert Bedrosian (1986: 37) with minor adaptations, is as follows:

And in his [Moses the Patriarch] third year, the 553rd anniversary of the birth of Christ occurred, and the 200 canons (which the learned Andreas, brother of bishop Mangnos arranged at the order of emperor Constantine) were completed, to compute the feast of Easter and other feasts. For after two hundred years, Easter fell on 25 March, while originally it was on 4 April. They could not go back to the beginning [in this method of computing] for after 25 March was 13 April, and there were nine discrepant days among them. For that reason, the feast days of the different calendars began to be confused. Patriarch Moses convened the wise men of that period (among them Athanas from the monastery of Saint Karapet the Precursor), and they established the Armenian era, by which they corrected the days for Easter of our Lord, as well as other feasts. However, they were unable to correctly arrange the ninth year. Now in the tenth year a certain Aeas the Alexandrian, a strong and learned man, spoke out about the confusion which existed in all the churches. He called to himself the wise men from all peoples: Adde from Cappadocia, Gigan from Syria, Elogs from Greece, Phineas from Judaea, John from Arabia, and thirty-six other men like himself and a multitude besides. Continuing the work of Andreas, they made it the same 532-year calendar. And they established an example beyond doubt, which was called Five Hundred, brilliant and faultless. They put at the beginning 4 April, so that as soon as the year 532 ended, the new cycle would be the same. Then they began to correct all the feasts and miracle-days of the calendar.

An anonymous text confirms the statement of Kirakos that Andreas was the brother of a bishop named Magnus and offers some additional information:

Andreas, brother of the bishop Magnus, having consented reluctantly to do so, worked very hard on the cycle of 19 years. He reconciled the calculations of different nations and invented the periods. During the reign of Gratian, an eminent man—who was martyred by the Arians because of his faith in Jesus Christ—undertook to review the work of Andreas and found it correct except for a few particulars in the 19-year cycle that did not accord correctly with the march of time. During the reign of Justinian, the period of 200 years of which Andreas was the author came to an end. Disorder followed in the calendar and in the cycle of the full moons. Therefore a wise man truly worthy of the name, originally from Alexandria, named Aeas, summoned a conference of men well versed in such matters: Addeus of Cappadocia, Phineas of

Judaea, John of Arabia, Sergius of Macedonia, Gigas of Syria, Joel of Ethiopia, and 36 others. (Dulaurier 1859: 59–61.)

ii. Anania of Shirak

The earliest witness is Anania of Shirak, who wrote about a hundred years after the events in question. Anania Shirakatsi is considered the father of the Armenian scientific tradition (Hewsen 1968). He was the author of a number of works on geography, mathematics, and astronomy. He also worked on chronology and the calendar. According to Samuel (*PG* 19. 694) and Kirakos (p. 55 Bedrosian), Anania was commissioned by the Patriarch Anastasius to devise a fixed calendar for the Armenians.

Samuel dates the activity of Anania to approximately the 362nd Olympiad, that is, to about 670. His efforts to introduce a fixed calendar had no immediate effect. Kirakos says that Anastasius was planning to submit the perpetual calendar of Anania to a council for confirmation, but died before having accomplished that objective. The thirteenth-century historian Vardan Areveltsi reports the same information (Thomson 1989: 178).

Among the surviving texts of Anania is an autobiography and the preface to a 532-year perpetual Paschal table. In 1897, F. C. Conybeare published an English translation of this tract. More recently, August Strobel (1984) has published a German translation with introduction, notes, and commentary. In Strobel's opinion, this text is a partially redacted version of the original treatise, of which the anonymous author mentioned above preserves a different and sometimes better version. I cite by the pagination of Conybeare's text.

Anania says (572–3) that he studied in Trebizond for eight years with Tychicus of Byzantium, who as a young man had served in Armenia 'until the reign of Maurice'. Thereafter, Tychicus travelled to Antioch and Jerusalem, lived for three years in Alexandria, 'several years' in Rome, and ten years in Constantinople, before returning to his home town of Trebizond. A few years later, his teacher in Constantinople died, but Tychicus refused an imperial invitation to return to the capital to take his master's place.

Maurice ruled in Constantinople from 582 to 602.[3] Tychicus must have taken up residence in Trebizond between about 600 and 620, and Anania studied with him sometime thereafter. Samuel's date for the work of Anania about 670 is therefore perhaps a bit late.

In the preface to his own 532-year tables, Anania's chief concern is to defend the work of Aeas and his colleagues in constructing a 532-year

[3] *Chronicon Paschale* 690. 9–17; Theophanes 252.

continuation of the Paschal list of Andreas. According to Anania (578–9, 583), Aeas and his colleagues generated a 532-year cycle of Paschal full moons that agreed with the true cycle established by the Fathers in every detail, except one. The ancient cycle began with 4 April, that date being the 14th day of Nisan and the true head of the cycle, whereas the cycle of Aeas began with 3 Nisan, because it was with 3 Nisan that the cycle of Andreas ended.

As we shall see, 3 Nisan is an error. Anania must have agreed with other Armenian authorities that the cycle of Andreas ended with 25 March, which should have been 4 Nisan in Anania's reckoning of the first month. I shall argue that the cycle of Aeas began from the Paschal full moon of 25 March for reasons other than the coincidence with the last year of the list of Andreas.

Anania (578) presents a brief, but interesting history of the 19-year cycle. The original inventor of the cycle was a man whom Anania calls 'Aristides the Merry, a philosopher of Athens, a companion and student of the apostle Kodratus'. Aristides constructed the 19-year cycle, 'for the Romans'. He put the Paschal full moon of 4 April at its head, because the world was created on 1 April and the moon was created full on the fourth day. After Aristides, Leonidas, the father of Origen, adapted the 19-year cycle for the use of the Egyptians and the Ethiopians. His son Origen built a 19-year cycle along similar lines for the Macedonians and the Arabs. Anatolius, the bishop of Laodicea, constructed a 19-year cycle 'for the Greeks'.

At the Council of Nicaea, Anania continues (579), the emperor Constantine decreed that Christians should no longer observe the Pasch with the Jews, but should instead adopt the 19-year cycle and instruct Christians everywhere in its use. During the reign of Constantius, Andreas, the brother of Magnus the bishop, composed a 200-year Paschal table, which was, Anania says, 'not without perplexities'. This remark probably refers to the fact that a 200-year list is not cyclical.

When the 200-year calendar of Andreas expired during the reign of Justinian, Anania says, there was a great deal of research done about both the 19-year cycle and the 95-year period. A conference of scholars was held at Alexandria under the leadership of Aeas. Those in attendance discovered that a 532-year period would accurately predict the dates for Easter. They did not, however, construct an entirely new cycle, but preserved the same sequence of dates for the 14th day of the moon as in the ancient 19-year cycle.

The early history of the 19-year cycle that Anania presents is fictional. By tracing it back to Aristides and his putative date for the creation of the world, Anania gives to the 19-year cycle both high authority and great antiquity. How the Armenian text came to give Aristides the epithet of 'merry', we do not know. Clearly, however, Anania is referring to the early second-century apologists Aristides and Quadratus, both of whom, Eusebius says (*HE* 4. 3), delivered speeches in defence of Christianity to the emperor Hadrian. That Aristides was greatly revered in Armenia we can infer from the fact that his *Apology* is preserved only in a Syriac translation discovered in the library of the Convent of St Catherine on Mount Sinai in 1889 and in some Armenian fragments published ten years earlier. Some fragments of the Greek text can also be recovered from the Christian romance known as *The Life of Barlaam and Ioasaph*, falsely attributed to the eighth-century writer John of Damascus.[4] The tale is a Christian adaptation of the story of the Buddha, first attested in a Georgian version of the ninth century (Lang 1957).

Anania agrees with the later Armenian sources that the list of Andreas began with the Paschal full moon of 4 April. The later authors are unanimous that it ended with the Paschal full moon of 25 March. Anania says (583) that Andreas ended with a Paschal moon on a date that the text designates as 3 Nisan. If 14 Nisan corresponds to 4 April as the true head of the cycle, then 1 Nisan is 22 March and 3 Nisan would be 24 March. Perhaps Anania or a later redactor simply added three days to 22 March and mistakenly counted 25 March as 3 Nisan. I proceed on the assumption that by 3 Nisan Anania meant 25 March.

The later Armenian sources associate the end of Andreas' list with the establishment of the Armenian era and the Christian year 553. If the Paschal list of Andreas began with a Paschal full moon on 4 April and ended in its 200th year with the 14th day of the moon on 25 March, then the list must have begun in the year corresponding to AD 353 and ended in 552. In those years the Alexandrian cycle produces a 14th day of the moon on 4 April and 25 March respectively. In a history of the calendar written in the fourteenth century, Hakob Ghrimetsi calculated that in the first year of the Armenian era Navasard, which is the first month of the Armenian year, began on the 11th day of the Roman month of July, and Epiphany fell on the 30th of Arats (Dulaurier 1859: 102). The year 1 of the Armenian era therefore began on the first day of the month of Navasard, corresponding in the Roman calendar to 11 July AD 552.[5]

The Paschal list of Andreas began in 353 and ended in 552. It was likely the same 'Paschalion of the Greeks or Macedonians' to which Victorius of Aquitania refers at the year 353. The older Armenian sources do not report the provenance either of Andreas or of his otherwise unknown episcopal brother Magnus. Following the lead of Hakob Ghrimetsi, Édouard Dulaurier referred to him as 'Andreas of Byzantium', and subsequent scholars have adopted that name.[6]

[4] Harris and Robinson 1891.
[5] Ginzel 1906–14: iii. 316–17; see Ch. 18 for additional evidence.
[6] Dulaurier 1859: 48, 102; Ginzel 1906–14: iii. 315.

iii. The Cycle of Andreas

Dulaurier believed that Andreas had done no more than continue the 95-year table of Anatolius for another 200 years. V. Grumel (1958: 41–8, 72–84) argued that Andreas reformed the 19-year cycle and in the process generated a new cosmic era. As I have explained in Ch. 5, this theory rests on no credible evidence.

Like Theophilus after him, Andreas generated a list containing a round number of Paschal dates. Theophilus drafted a list of 100 years, Andreas produced a 200-year table. Beginning with the Paschal full moon of 4 April 353, this list was a continuation of the 95-year cycle of Anatolius. His only reform was to adopt the form of the Anatolian cycle that Athanasius drafted for the Council at Sardica in 343. I have argued in Ch. 8 that Anatolius had the *saltus* at the twelfth year, producing dates for the Paschal full moon of 6 April, 26 March, and 14 April, where the classical cycle has 5 April, 25 March, and 13 April. I have also suggested in Ch. 9 that Athanasius modified the cycle such that it now presented 6 April, followed by 25 March and 13 April. This is the form that we find preserved in the 95-year table published by van de Vyver (1957), which began originally with the Paschal full moon of 4 April in AD 334.

The Armenian tradition attests to the same form of the Anatolian cycle as having been incorporated into the 200-year list of Andreas. As we shall see, Anania and the whole Armenian tradition until modern times defended the date of 6 April for the Paschal full moon in the year that corresponded to the ninth of an Anatolian cycle. The Armenian sources are also unanimous that the 200-year list of Andreas ended with 25 March and that 13 April should have followed.

2. AEAS AND THE CONFERENCE AT ALEXANDRIA

i. The Conference at Alexandria

According to the Armenian sources, the expiration of the list of Andreas prompted a conference of experts under the leadership of Aeas of Alexandria. Anania Shirakatsi's narrative continues as follows (579):

For this reason an investigation was made at Alexandria, which is the metropolis of all sciences; and there was found a cycle free from inaccuracies of 532 years, which accurately shows the 14 days of the Pascha. But they did not go so far as to give a new form to and efface the canon previously fixed and written down; but they exactly fixed the same 14 days adhering to the same method over nineteen times nineteen [*sic*!

correctly, ‘twenty-eight’?], in order that the results arrived at might be quite clear and give offense to none. And the sum of these was calculated by philosophers, namely by Aeas of Alexandria, who associated with himself the Jew Phineas from Tiberias, Gabriel of Syria, John from among the Arabs, and Abdiah from the Ethiopians, Sergius from the Macedonians, Eulogius from the Greeks, Gigas from the Romans. And Aeas had with him others also, from among the same Egyptians, whose names we have not mentioned in this history. In fact it is said that in all there were employed 36 persons.

The anonymous text that seems to represent another version of Anania’s account describes the work of the conference as follows:

They met in order to determine through careful research the return of the sun and the moon to the same point in the same year. They found that this concordance repeats after 28 revolutions of 19 years, or 532 years. Thus they created an infallible period of 532 years at the end of which the data repeat as at the beginning. They found also that the period ends with 25 March and begins from 13 April. Because nine years had elapsed since the beginning of the 19-year cycle, they took 4 April as their point of departure and designated that year as the tenth of the Armenian era. Thus they took account of the passage of nine years and of 19 in 19 [*sic*!] and so the 500-year period opened with 4 April. (Dulaurier 1859: 60.)

Anania, Guiragos, and the anonymous text differ somewhat in their lists of the participants—a matter that need not concern us here. Another disagreement in detail is more interesting. Samuel and Guiragos say that Aeas and his colleagues established a Great Cycle with 4 April at its head beginning in the 10th year of the Armenian era. Anania says that such a cycle should have begun from 4 April, but that the 36 scholars at Alexandria began instead from 3 Nisan, by which he means 25 March. The anonymous author says that Aeas and his colleagues established a 532-year period beginning with 13 April and ending with 25 March, but that they took 4 April as their starting point, because nine years had already elapsed. Why Anania makes the cycle begin from 25 March and the anonymous author from 13 April is a matter to which I shall return.

ii. The Intervention of Irion

The delegates returned to their respective cities to put the new cycle into effect. At this point, however, a man named Irion—or ‘Iron’, as the name appears in some texts—intervened to destroy the agreements reached. ‘Irion’ is not a recognizably Greek name, unless it is an Armenian corruption for ‘Hieron’.

According to Anania (579–83), Irion was a scholar attached to the imperial court at Constantinople, but originally from Alexandria. He had not been invited to the conference at Alexandria. Out of spite, he therefore opposed everything that had been done. He insisted that 5 April, not 6 April, must be the correct date for the 14th day of the moon at the appropriate year of the cycle, and that 5 April should appear at the beginning ('well-head') of the cycle. Irion claimed that the moon was 13 days old at the time of its creation, and he engaged in complicated calculations of the epacts to justify this and other manipulations of the cycle. Irion also insisted that 5500 years had elapsed from creation to the birth of the Saviour, basing that claim on the dimensions of the Ark of the Covenant, which was five cubits and a half. Anania counters that the spatial dimensions of the Ark have nothing to do with the measurement of time and that the moon could not have been created in its 13th day and therefore less than perfect. Irion did not change the 532-year cycle of Aeas, Anania says. He only built an absurd superstructure upon it in order to justify substituting the date of 5 April for that of 6 April in the list of Aeas. Anania adds that Irion insisted on using the Egyptian calendar, basing his system on the 10th day of Pharmouthi (5 April) and accusing Aeas of failing to understand his own country's calendar. Irion managed to obtain an edict from the emperor and thus 'established his method all over the world'.

The parallel text offers a similar account, which can be paraphrased as follows:

> Irion of Constantinople, a false doctor if ever there was one, attached to the court of Justinian, took it as an insult that he had not been invited to the conference. Irion was determined to destroy their work. He changed 17 April to 16 April and 6 April to 5 April. He justified this by the use of fractions of five. By a doctrine peculiar to himself, Irion counted 5500 years from the beginning of the world to the birth of Christ, taking the dimensions of the Ark of the Covenant as a foretype. With this reckoning, Irion defied the wisdom both of Eusebius and of Andreas. Eusebius had pointed out that differences in the life-spans of the patriarchs in the Book of Genesis between the Greek, Hebrew, and Samaritan versions make it difficult to calculate the age of the world. Andreas followed the Greek version, which is the correct one. He counted 5600 years to the birth of Christ, which makes a total of 6153 years to the beginning of the Armenian era. (Dulaurier 1859: 60–1.)

Kirakos confirms Anania's reference to the emperor. Just as Eulogius, the Greek representative at the conference, was about to present the results to Justinian, Irion intervened. Through an examination of the numbers 5 and 6, Irion imposed an entirely different system, changing 17 April to the 16th and 6 April to the 5th (p. 37 Bedrosian).

There is nothing in Greek sources about any such conference nor any reference to a decree of the emperor Justinian regularizing Paschal calculations. The story nevertheless has the ring of truth. Both Kirakos and the anonymous text say that Irion manipulated the epacts by using 'fractions of 5 and 6'. The accusation is reminiscent of the complaints of Maximus the Confessor (*PG* 19.

1227–9, 1261) against ‘those who multiply by five and six’ and thus miscalculate the age of the moon. The ‘fractions of 5 and 6’ are a method of calculating the age of the moon, by distributing the extra day of the *saltus* fractionally through several years of the cycle. According to Maximus, the method adds 5/60 of a day in each year of the cycle, so that the tabular date of 17 April in the 19th year of the cycle is recalculated as the 16th day of the moon, instead of the 14th. Correctly applied, such a method should add 3/60 of a day to each year of the cycle or 5/60 should be added only in 12 years of the cycle. The Paschal full moon of 17 April appears at the end of the classical Alexandrian cycle, with the *saltus* intervening to produce 5 April in the first year of the next cycle. By the fractional method, correctly applied with the addition of 3/60 of a day each year, the calculated date of the Paschal full moon in the last year of the cycle would be 16 April, instead of the tabular date of 17 April. Hence Irion, according to the sources, changed 17 April to 16 April. It follows that the first year of the next cycle would have 5 April instead of 6 April.

Maximus also attributes to this party the recalibration of the Alexandrian cycle and the addition of sixteen to the count of the years from Adam—a calculation that results in what we call ‘the Byzantine era’ corresponding to 5509/8 BC (see Ch. 13). Arthur Mentz (1908) argued that Irion was in fact the inventor of the Byzantine calculation. As Grumel (1958: 103–8) has pointed out, however, Irion must have been a defender of the Alexandrian era of Annianus, with its date for creation corresponding to 25 March 5492 BC. That calculation carried with it a date for the Incarnation corresponding to 25 March at the turn of the year 5500/1. Texts that use the Byzantine era date the Incarnation to 5506 or 5507 (Cedrenus i. 321). The Armenian sources are clear that Irion defended the more traditional interval of 5500 years from Adam to the Incarnation. In claiming that the moon was created on 4 April in the 13th day of its course, Grumel argues, Irion simply moved the date of creation from Sunday, 25 March 5492 BC, to Sunday, 1 April. Thus, in the first year of the Alexandrian cycle, with the date of the Paschal 14th moon on 5 April, the moon was in its 13th day when created on Wednesday, 4 April.

The Armenian descriptions of Irion’s method are too confused to permit reconstruction of his procedures. The similarity to the method of the computists whom Maximus criticizes nevertheless shows that the story of Aeas and Irion is not an Armenian invention.

iii. Paschal Controversy during the Reign of Justinian

We do hear of one incident during the reign of Justinian that might provide the context for a conference on Paschal calculations. John Malalas (18. 96, p. 408 Thurn), a contemporary of Justinian and the earliest Byzantine chronicler, says that there was a dispute during the reign of Justinian about the beginning of the fast. The emperor decreed an additional week during which meat might be sold. The butchers offered meat for sale, but no one would eat it. Easter was observed in accordance with the emperor's decree. Malalas dates the episode to the month of November and includes the notice in a list of events that occurred between a seventh and a tenth indictional year. The month must be an error for 'February'. The seventh indictional year corresponds to 543/4.

Theophanes (225.5–10) and George Cedrenus (i. 656.16, 657.20–658.2) both date the incident to 4 February in the 19th year of Justinian. The correct date of the 19th year of Justinian was 545/6.[7] Cedrenus associates the 16th year of Justinian with a seventh indictional year. By that chronology the 19th year was 546/7.

Another version of the incident appears in the eighth-century Syriac chronicle attributed to Dionysius of Tel-Mahre. According to Witold Witakowski (1996: xxv–xxix), the chronicler's source was the historian John of Ephesus, another contemporary of Justinian. In the year 857 of the Seleucid era, the chronicler says, there was confusion in Alexandria, in Constantinople, and throughout the East about the beginning of the fast. Some began the fast two weeks early, others a week later. In the capital, when the fast had been observed for a week in accordance with the law, the emperor and his nobles decided that the fast would begin only after another week. The butchers reluctantly complied with the order to sell meat, but only a few gluttons would approach it. The period of Lent and Easter thus passed amidst great confusion (Witakowski 1996: 108).

The year 857 of the Seleucid era began in September or October of AD 545, if reckoned by the Syro-Macedonian calendar, in March of 546 by the Babylonian calendar. If Theophanes and Cedrenus are right that it was on 4 February that the people began the fast, then the year must have been 547. In that year the Alexandrian calculation, in both the Anatolian and the classical form, prescribes Easter for 24 March. The seventh Sunday before Easter was 3 February, and the Lenten fast would begin on Monday, 4 February. Victorius of Aquitania (Krusch 1937: 51) also prescribes Easter for 24 March in that year. The Roman 84-year cycle had fallen into disuse by the time of Justinian. It too would produce 24 March, if the 14th day of the moon were allowed to fall as early as 17 March, otherwise 21 April in the next lunation (see Ch. 11). Given these agreements, it is difficult to understand how a dispute might have arisen for that year. Nor is there any other year in the 540s for which a disagreement in calculation would obviously have occasioned the incident. Perhaps Justinian mistakenly believed that Easter should not be observed before 25 March, the traditional Roman date

[7] *Chronicon Paschale* 617. 18–21; Theophanes 173–4.

of the equinox, and therefore postponed the feast to 31 March. If so, he must have been too busy with other matters to worry about the date of 23 March that appeared in the tables for 536.

Whatever the correct date and source of the dispute, the incident shows that disagreements about the date of Easter could still arise as late as the reign of Justinian, so that an effort such as that of Aeas and his colleagues to produce a definitive new calculation is not implausible.

Procopius reports a decree of Justinian forbidding the Jews to observe Passover before Easter: 'Whenever the returning months happened to bring the Passover Feast before that kept by the Christians, he would not permit the Jews to celebrate this at the proper time.'[8] Procopius says that the police would arrest Jews who tasted of the flesh of lambs contrary to the laws of the state. The context and intent of this decree are not clear. Stern (2001: 85–8) suggests that Justinian intended to impose a rule of the equinox upon the Jews. In that case, the decree might constitute further evidence of an interest in Paschal calculations on the part of the emperor.

3. THE 19-YEAR CYCLE AND 532-YEAR PERIOD OF AEAS

The Armenian sources are not clear about the structure of the cycle that was agreed upon in Alexandria. Both Samuel of Ani and Kirakos state that nine years of confusion passed before Aeas finally in the tenth year summoned a conference and established the 532-year cycle. Kirakos says they put 4 April at the beginning of the 532-year period. Anania Shirakatsi says nothing about the Armenian era or its tenth year. He says that the cycle of Aeas was correct in every respect, except that it began with the Paschal full moon of 3 Nisan (24 or 25 March), instead of 14 Nisan (4 April). The anonymous text says that Aeas and his colleagues discovered the 532-year period and decided that it should begin with 13 April and end with 25 March. The same text then states, like the later sources, that nine years had already elapsed and so 'they took 4 April as their starting point and designated the year as the 10th of the Armenian era'.

i. The Theories of V. Grumel and A. Strobel

Grumel (1958: 100–4) believed that the 19-year cycle of Andreas actually began with 13 April and ended in its last two years with 6 April and 26 March.

[8] *Procopius, Secret History*, 28. 16, translation of G. A. Williamson.

The Alexandrian cycle has 5 April and 25 March in those years. Grumel argued that Aeas and his colleagues reached a compromise whereby the Alexandrians agreed to accept 6 April and the Armenians agreed to accept 25 March. Aeas effected the compromise by moving 25 March to the head of the cycle and inserting the *saltus* at that point, so that 25 March followed 6 April.

Irion then intervened, Grumel continues, and persuaded the emperor Justinian to make 5 April the law of the land. The Armenians ignored the edict and generated their own cycle beginning as the list of Andreas had, with 4 April. They retained their traditional date of 6 April in the appropriate year of the cycle, but accepted the compromise that had been reached to insert the *saltus* after 6 April so as to produce 25 March in the next year.

Grumel (1958: 102) finds evidence for the cycle of Aeas in the 19-year cycle preserved by the eleventh-century Nestorian bishop and polymath Elias of Nisibis as being in use among the churches of the orient. For this cycle, Elias says (pp. 114, 122 Chabot), one adds 12 to the years numbered from the Seleucid era and divides by 19 to find the remainder. If the remainder is 1, the 14th day of the moon is on 25 March. Elias continues through the numerals, concluding in the last two years with 17 April and 6 April. Thus this is a cycle beginning with 25 March, with the *saltus* appearing at the end of the 19th year, between 6 April and 25 March at the beginning of the next cycle. Al-Biruni (p. 300 Sachau) also says that the cycle in use among the Syrians began with the Passover on the 25th day of the month of Adar, i.e. 25 March.

Grumel also believed that the cycle of Aeas was accepted, at least for a time, in the Byzantine churches. Grumel maintains that Irion did not change the base-date of the cycle, but only insisted that its last year should have the Paschal full moon on 5 April, not 6 April. For this conclusion, he cites a computistical tract circulated under the name of the emperor Heraclius in which the author takes 25 March as a base-date for calculation. Grumel describes that tract as having the 14th day of the moon on 21 March at the 15th year of the cycle, that of 5 April at the 19th year—one year in advance of the Alexandrian cycle.

Grumel misinterpreted the text. The author of this tract (*PG* 92. 1123–32) does not describe a 19-year cycle with 25 March at its head, but rather presents formulae for calculating solar and lunar epacts. The formula for the lunar epact is based on counting the number of years since the 8th indictional year in the reign of Maurice, 589/90. The author counts 34 years from that point to the present year, which is the 11th of an Indiction. He divides by 19, finds a remainder of 15, and computes 15 epacts by a formula similar to that used by Dionysius Exiguus, producing a Paschal full moon on 21 March. That is, $15 \times 11 = 165$, which is divisible by 30 with a remainder of 15. The author counts the years from the 8th indictional year inclusively, as the sum of 34 from an 8th to an 11th indictional year shows. He does not state that the Paschal moon of 21 March is the fifteenth year of the cycle, but that the remainder after subtracting 19 from 34 is 15.

The reason the formula works is that the year 589/90 has 11 epacts in the classical Alexandrian cycle. With that year counted as 1, the formula produces $1 \times 11 = 11$. Later in the passage, however, he mistakenly states that the 8th Indiction in the reign of Maurice has no epacts. The formula requires 11 epacts in that year, and it is most likely that the author is using the standard Alexandrian cycle, which he, like Maximus, calls 'the ecclesiastical tradition'. There is any case no basis for concluding from this text that the Byzantime empire at one time used a 19-year cycle beginning from a 14th day of the moon on 25 March.

The statement of Anania that Irion made 5 April 'the well-head of the cycle' shows that Irion was a strict defender of the Alexandrian cycle of Annianus, which began with a Paschal full moon at that date. The decree of Justinian simply put that cycle into effect throughout the empire and made it the 'ecclesiastical tradition' to which Maximus attests.

Grumel's claim that the cycle of Andreas began with the Paschal full moon of 13 April and had 6 April and 26 March at the last two years is based on his erroneous theory that Andreas reformed the cycle of Anatolius and changed its base-date. The hypothesis contradicts the unanimous testimony of the Armenian sources that the 200-year list of Andreas ended with 25 March. Grumel is forced to assume that Anania and later authorities following him were wrong on this point.

August Strobel (1984: 141–4) argued that the cycle of Aeas actually began not with 25 March, but with 6 April. Both the lunar cycle and the 532-year period began, in Strobel's view, with the full moon of 6 April in the year corresponding to 551. He suggests that the date of 25 March for the beginning of the cycle is a falsification on the part of the redactor of the text attributed to Anania. Strobel bases this claim on his translation, according to which it was 'the successors (*Nachfolger*)' of Aeas who made the cycle begin on 25 March. Conybeare (1897: 583) translates 'the followers of Aeas'. The transliterated Armenian word is *Easank'*, which is a collective noun based on the Armenian form of the name Aeas. The literal translation would be 'those of Aeas'.[9]

It is clear from the context that by 'the followers of Aeas' the author means Aeas and his colleagues at the conference at Alexandria and those who adopted their cycle. There is no implication that these 'followers' changed the cycle. Strobel dismisses Grumel's appeal to the cycle of the Nestorian church preserved by Elias of Nisibis with 25 March at its head on the grounds

[9] Timothy Greenwood by email dated 12 Mar. 2008.

that this evidence is too late and from too disparate a tradition to support the conclusion that Aeas began his cycle with 25 March.

Grumel believed that both the 19-year cycle and the 532-year period of Aeas began from 25 March of the year corresponding to AD 552. The Armenians subsequently generated their own 532-year cycle beginning with the Paschal full moon on 4 April of the year corresponding to 562. Strobel makes the 532-year cycle of Aeas begin with 6 April 551. Neither of these theories offers a persuasive synthesis of the evidence. In particular, neither can explain the origin of the Armenian era with a 14th day of the moon on 13 April in its first year.

ii. The Armenian Era

With the exception of Anania, the other Armenian sources claim that nine years elapsed between the end of the list of Andreas and the time that the conference of Aeas met in Alexandria. Grumel (1958: 99, 141–2) accepts this claim and says that it is important to distinguish between the establishment of the Armenian era and the establishment of the 532-year cycle. He believes that the Armenian era was established at the Council of Dvin, which he dates to 552/3. The Armenians began to number their years from that point, but nine years elapsed before they could persuade Justinian to convene a conference to settle matters.

As we shall see, the correct date of the Council of Dvin is March of 555. Grumel's version of events would make little sense, even without that error. Neither the Armenians nor anyone else would have established a chronological era beginning from 'the year 1 of confusion'. Nor is it likely that nine years elapsed before Aeas gathered a conference of experts at Alexandria to deal with the question of how the list of Andreas should be continued.

The cycle of Andreas was a continuation of the cycle of Anatolius, incorporating the revisions of Athanasius. It may well have remained in use in many regions of the eastern empire even after Cyril of Alexandria had urged Theodosius II to adopt the reformed Alexandrian cycle of Annianus. A conference of the kind that the Armenian sources describe, with representatives from Rome, Macedonia, Cappadocia, Syria, and Palestine, is unlikely to have been convened solely at the urging of the Armenians. If the 200-year list of Andreas was widely in use, its imminent expiration would have prompted a conference such as the Armenian sources describe, and that conference would have met in advance of the year in which the list would end.

The Armenian sources assume that their era was formally established in the 550s, about the same time that the year 1 itself began. They preserve discordant dates, some of which probably result from textual corruption. More seriously, they also disagree about who was the Armenian patriarch at the time.

The earliest evidence comes from a late seventh-century text to which Timothy Greenwood (2008) has recently drawn new attention. The text has sometimes been attributed to Anania, but Greenwood argues that it was the work of Pilon Tirakasi. It includes a chronicle of ecclesiastical history from the birth of Christ to the second year of Justinian II (686). Under the reign of Justinian I, the author notes that the Armenian era was established in his 20th year and that the Alexandrians established the 532-year cycle in the 34th year of Justinian.[10]

The next witness is John Catholicos (Hovhannes Draskhanakerttsi), who wrote a history of Armenia ending in the 920s AD. He says (Dulaurier 1859: 173) that in the 10th year of the patriarchate of Moses, the 31st year of Chosroes, the cycle of 532 years ended. Therefore, at the order of Moses, several scholars versed in calendrical science established an era for the Armenian nation so that they would no longer need to rely on foreign calculations for the regulation of holy days.

Stepanos Asoghik of Taron wrote a universal history in the year 454 of the Armenian era, AD 1005. He says (Dulaurier 1859: 173–4; 1883: 115) that the patriarch Nerses gathered a council in the city of Dvin, of whom the chief members were the learned bishop Peter of the province of Siounik and Ner-Schabouh of Taron. There they established the Armenian era in the 14th year of Justinian, the 24th of Chosroes, and the 304th of the era of the Greeks. Justinian became emperor in April 527.[11] Chosroes acceded to the Sassanid throne of Persia in August of 531.[12] The 14th year of Justinian was 540/1. The 24th year of Chosroes was 554/5. The 304th year of the era of the Greeks was, as we shall see, the year 552/3, the first year of the Armenian era. The 24th year of Chosroes is the correct date for the council of Dvin, as will be explained shortly. The 14th year of Justinian must be a scribal error.

A text attributed to Hovhannes Kozern dates the establishment of the Armenian era to the 7th day of the month of Arats, the 10th year of John as Catholicos of Armenia, the 25th year of the emperor Justinian, the 25th year of Chosroes as King of Persia. The note adds that when the Armenian era was established 5976 years had elapsed since Adam, 552 years since the birth of Christ.[13] Other sources tell us that in the first year of the Armenian era Epiphany fell on 30 Arats (Dulaurier 1859: 102–3). If 6 January was 30 Arats, 7 Arats corresponded

[10] Dr. Greenwood communicated this information to me by email dated 12 Feb. 2008; he does not discuss the entry in his published article.

[11] *Chronicon Paschale* 617. 18–21; Theophanes 173–4.

[12] Agathias 2. 213, 4. 244; Cameron 1969: 89, 110, 132, 160.

[13] Chamchian 1784: ii. 509, as cited by Dulaurier 1859: 174–5.

to 14 December. Since Kozern refers to the month of Arats, rather than Navasard, he seems to be dating a meeting at which the Armenian era was adopted, rather than specifying the date of the Armenian era itself. Dulaurier (1859: 51–5) thought there was such a meeting in December of 552. Yet 7 Arats in the 25th year of Justinian would correspond to 15 December of 551. That would be a plausible date if the Armenians took some kind of action before the expiration of the list of Andreas. If Kozern meant to date the Armenian year 1 to the 25th year of Justinian, then he must have counted the years from 528, instead of 527. In that case, the 10th year of the Armenian era would be 34 Justinian, in agreement with the date of Greenwood's text for the establishment of the 532-year cycle. The 25th year of Chosroes must be an error, as is the 20th year of Justinian as a date for the Armenian era in the seventh-century chronographic text.

Hovhannes Kozern was an authority on the calendar whose work survives only in fragments. The early twelfth-century chronicler Matthew of Edessa says (pp. 41–3, 56–60 Dostourian) that Kozern was the most learned man of his day. He wrote a letter to the emperor Basil defending the Armenian calculation for the date of Easter in the Armenian year 455, AD 1007. That was one of the years when the Armenian preference for 6 April, rather than 5 April, as the date of the 14th day of the moon, resulted in Easter on 6 April for the Greeks, 13 April for the Armenians. Thirty years later, Matthew says, Kozern explained an eclipse of the sun in the Armenian year 485 as marking the passage of a thousand years since the Crucifixion. An annular eclipse visible in the area is dated astronomically to 29 June 1033.[14] That date corresponds to the Armenian year 482.

These sources disagree as to whether the Patriarch at the time was Nerses, John, or Moses. Later authors follow John Catholicos in naming Moses. Samuel of Ani enters his note on the establishment of the Armenian era at the third year of Moses (*PG* 19. 683). Kirakos agrees. He says that in the year 553 since Christ, the third year of his patriarchate, Moses convened the wise men of that time, among them Athanas from the monastery of St Karapet, and they established the Armenian era, by which they corrected the days for Easter of our Lord (p. 37 Bedrosian). The late 13th century writer Stepanos Orbelian says it was in the fourth year of Moses and the year 553 since Christ that the 200-year list of Andreas ended (Dulaurier 1859: 64). Mkhitar of Airivank, writing about 1290, says that Athanas of Taron established a calendar for the Armenians at the behest of Moses (Dulaurier 1859: 65).

The association of Moses with the establishment of the Armenian era requires something like the traditional chronology of the patriarchs as established by Samuel of Ani. Samuel dated the first year of Nerses to 527, that of John Gabeghean to 536, and the accession of Moses to 551. Stepanos of

[14] Espenak and Meeus 2006: #7201.

Taron's association of Nerses with the adoption of the Armenian era at the Council of Dvin requires a revision of that traditional chronology.

Stepanos says that Nerses convened the council in the fourth year of his patriarchate, the 14th year of Justinian, and the 24th year of Chosroes. Including the error in the regnal year of Justinian, the statement agrees with a history of the councils supposed to have been read at the Council of Manazkert convened in 726 by the Catholicos John of Odzun: 'At the beginning of the Armenian era, Lord Nerses Catholicos held the sixth council, in the city of Dvin, the 4th year of his patriarchate, the 24th of the reign of Chosroes as king of Persia, the 14th year of the emperor Justinian.'[15]

The chief personages present, according to Stepanos, were Peter of Siounik and Nershabu (Mersupah) of Taron. The names of Peter and Mersupah, along with that of Nerses, stand at the head of the 'Concord of Union' that issued from what scholars call the 'Second Council of Dvin', at which the Armenian church condemned the doctrines of Nestorianism. The document is dated to Palm Sunday in the 24th year of Chosroes—29 March 555.[16]

The near coincidence between the date of the council and the first year of the Armenian era led Stepanos to infer that the council under the leadership of Nerses had established that era. Grumel (1958: 142) accepted that claim. More recently, Nina Garsoian (1999: 144) has rejected it. Nevertheless, the firm association of Nerses with the council and the council with the 24th year of Chosroes requires the chronology of the Armenian catholicate to be revised accordingly. Modern scholars date Nerses from 548 to 557, John from 557 to 574, and Moses from 574 to 604.[17]

This revised chronology precludes any association between Moses and the beginning of the Armenian era. Relying on the tradition about Moses, Grigor Broutian at the Byurakan Astrophysical Observatory has recently argued that the first year of Moses should be restored to its traditional date in 551. He believes that the date of the council of Dvin or the name of the patriarch who convened it should be revised accordingly. Accepting the statements of Kirakos and Mkhitar, Broutian attributes the creation of the Armenian era to Athanas of Taron. Athanas devised a continuation of the cycle of Andreas, perhaps a 95-year table, beginning from the Paschal full moon of 13 April in the year corresponding to 553. Nine years later, according to Broutian, Aeas of Alexandria established the 532-year period. The Armenians adopted the

[15] The document is preserved in the Book of Letters *(Girk Tghtots*); for French translation of the relevant portion see Dulaurier 1859: 178.

[16] Book of Letters; for French translation see Garsoïan 1999: 476–9; on the date, ibid. 137 with n. 12.

[17] Ormanian 1910, appendix I.

532-year period, but not the fixed calendar that Broutian believes the conference at Alexandria had proposed for Armenian use.[18]

The discrepancies in the Armenian sources, both in the regnal years and in the name of the Catholicos, admit of no easy solution. The association of Nerses and the 24th year of Chosroes with the establishment of the Armenian era derives from the belief that the Council of Dvin formally adopted that system of chronology. There are two ways of accounting for the tradition about Moses. First, John Catholicos reconstructed the list of Armenian patriarchs incorrectly and wrongly concluded that Moses had been patriarch at the beginning of the Armenian era. Most later authors followed him in this error. Second, the name of Moses is rightly associated with the adoption of the Armenian era, but that decision took place in the 570s or later. When Samuel of Ani or his sources built the list of patriarchs, they wrongly assumed that Moses had been patriarch at the beginning of the Armenian era.

The date of the Council of Dvin in 555 and the name of Nerses as its president are firmly established from documentary evidence. Broutian's proposal to restore Moses to his traditional date in the 550s seems implausible. If Nerses was patriarch during the 550s, then John occupied the chair in the 560s. The fact that the 10th year of the Armenian era was within the patriarchate of John may account for Kozern's belief that the Armenian era was established during his tenure.

It is unlikely that the Armenian church ever formally established the Armenian era at all. The earliest usage of the era appears in the seventh-century chronographic text mentioned above (Greenwood: 2008). The last entry is dated to the tenth day of the month of Sahmi, in Armenian era 134. Such numbering is not attested again until an inscription dated to the Armenian year 232 (Greenwood 2004: 87). The eighth-century historian Ghevond Yerets dates the martyrdom of Sahak and Hamazasp at the hands of the Arabs to the day of Epiphany in the Armenian year 233, during the Caliphate of Musa (p. 44 Bedrosian).

A numbering of the years from the first year after the end of the 200-year list of Andreas is best explained as based on a new Paschal list that began in that year. Grigor Broutian attributes such a list to Athanas of Taron and follows the Armenian sources in believing that Aeas convened his conference at Alexandria nine years later. It is more likely that the conference had already met and that Athanas adopted a version of the cycle of Aeas. According to the anonymous version of these events, the council generated a 532-year period

[18] Broutian 1997; I have relied upon an English summary at the end of the book, much of which is available also at http://www.hyeetch.nareg.com.au/armenians/names_p3.html, and upon email correspondence with Dr Broutian during May 2006.

beginning with a Paschal full moon on 13 April and ending with 25 March. What Athanas established, whether it was in the 550s or the 570s or later still, was not the Armenian era, but a version of the reformed Paschal calendar of Aeas based on a 532-year Paschal period beginning from the Paschal full moon of 13 April. The Armenians numbered their version from 13 April of the year corresponding to 552/3, because that was the first year after the end of the list of Andreas. By a process analogous to the gradual adoption in Europe of Dionysius' years AD, this numbering of the years found its way into historical chronology as 'the Armenian era'.

iii. 25 March or 13 April?

The later Armenian sources are unanimous that the cycle of Andreas ended with the Paschal full moon on 25 March in the year corresponding to AD 552. Anania Shirakatsi says that the cycle of Aeas was correct in its dates for the 14th day of the moon. It differed from the cycle of Andreas in that it began from the 14th day of the moon on 3 Nisan, instead of 14 Nisan, because it was with 3 Nisan that the list of Andreas ended.

As I have explained above, 3 Nisan is an error. Anania meant to say that the cycle of Aeas began with the 14th day of the moon on a date equivalent to 25 March. A 19-year cycle beginning from 25 March, with its *saltus* at the now standard Alexandrian position at the end, produces just the sequence of epacts that Anania and the later Armenian tradition defend. The dates for the 14th day of the moon agree with those of the classical Alexandrian cycle at every year except the last, where 6 April appears instead of 5 April.

Yet the anonymous text says that Aeas and his colleagues decided that a 532-year period should begin with 13 April and end with 25 March. The Armenian era presupposes a cycle of this kind. As the example of Victorius of Aquitania shows, it is not necessary for a 532-year period to begin at the same year as the 19-year cycle (see Ch. 11).

The 19-year cycle of Aeas seems to have begun from 25 March, while his 532-year period began in the following year with a Paschal full moon on 13 April. The cycle beginning with 25 March has the advantage of bringing to its head a date with mystical significance in both the Alexandrian and the Roman traditions. The 532-year period beginning with 13 April has the advantage of beginning with epact 1 as of 1 January, facilitating calculations in the Roman calendar. The oriental churches adopted the 19-year cycle of Aeas. The Armenians adopted the 532-year period that began in the following year with 13 April. There is evidence that a 19-year cycle beginning with 13 April was also in use for a time in Syria and Georgia.

Werner Strothmann (1977: 12–15, 75) published a Syriac text written in Beirut in the ninth century. It contains a list of 15 calendar dates, beginning with 2 Nisan (2 April) and ending in the last two years with 6 Nisan (6 April) and 25 Adar (25 March). Strothmann erroneously believed that this was a list of Easter dates. As Sebastian Brock (1995: 120) has shown, it is in fact a portion of a 19-year cycle listing the dates for the 14th day of the moon. Three years are missing from the middle, between the dates of 24 March and 9 April. One year is missing either at the beginning or the end. The dates are the standard Alexandrian and Byzantine dates with two exceptions. The 14th of April, instead of 15 April, appears after 27 March and before 4 April. The 6th of April, instead of 5 April, appears in the next to the last entry between 17 April and 25 March. The date of 14 April is clearly a scribal error, as it disturbs the sequence of 11- or 19-day intervals from one date to the next. Brock thinks that there is a missing year at the end. That inference would make this an example of the Byzantine cycle beginning with 2 April, but with a discrepancy at 6 April. It is more likely that the missing year was at the beginning. In that case, the cycle was of the type that the anonymous text attributes to Aeas. It began with 13 April and ended with 6 April and 25 March.

Evidence that the 532-year period of Aeas originally began with 13 April can be found in the 'era of the Romans' to which we find reference only in Armenian sources and perhaps in one passage of the *Chronicon Paschale*. The Georgian period known as the *k'ronikon* is closely related and has a base-date corresponding to this era of the Romans.

iv. The Era of the Romans

Years numbered from the Armenian era sometimes appear in conjunction with a numbering from the 'era of Rome'. The colophon to a commentary on the Song of Songs is dated to the year 422 of the Armenian era and 725 of the era of Rome (Greenwood 2003*a*, #75). A copy of the Gospels was written 'in Armenian era 438 and according to the era of Rome 742' (Greenwood 2003*a*, #85). The interval is either 303 or 304 years. Stepanos of Taron says that the Armenian era was established in the 304th year of what he calls the 'era of the Greeks', which he says began in the seventh year of the emperor Philip.[19]

If the Armenian year 1 began in July of 552, then the year 1 of the Greeks was 248/9 or 249/50, depending on how one interprets the interval of 304 years. The number 304 is a multiple of 19, so that 248/9 and 552/3 both correspond to the same year of a 19-year cycle. The year 248/9 is therefore the

[19] Dulaurier 1859: 173–4; 1883: 115.

likely candidate for the 'era of the Greeks'. The variation in nomenclature derives from the fact that the Greeks of the eastern empire considered themselves Romans. Outside Armenia, the era of the Greeks is a reference to the Seleucid era (see Ch. 2).

The rationale for the era is explained in a fragment from the treatise 'On the Calendar' written by John the Deacon (Hovhannes Sarkavag) in the early twelfth century:

> The first year of the reign of the Roman emperor Philip was the 1000th year since the foundation of Rome. From the second year of this ruler, they established the starting point of the era that we call 'the era of the Romans'. From that epoch to the beginning of the 200-year cycle of Andreas and of the 95-year cycle—for both cycles were established from the same year, although not by the same author—there is an interval of 104 years. (Dulaurier 1859: 48.)

Hakob Ghrimetsi (Dulaurier 1859: 151 n. 138) provides almost the same information as John the Deacon. Instead of saying that there is an interval of 104 years from the era of the Romans to the beginning of the list of Andreas, Ghrimetsi says that the second year of Philip and the beginning of Rome's second millennium was the year 249 from Christ. John's interval of 104 years counted to the beginning of the 200-year list of Andreas is consistent with an interval of 304 years to the beginning of the Armenian era. Grhimetsi's date in the Christian year 249 is consistent with an interval of 104 years to the beginning of the list of Andreas. A 95-year table beginning in 353 would have been a continuation of the 95-year table of Anatolius, but we know of no such table apart from the reference of John the Deacon.

Philip the Arab ruled from 244 to 249. In the *Chronicle* (p. 217 Helm), Eusebius stated that Philip was the first Christian emperor and that during his reign the 1000th anniversary of the city was observed with games lasting three days and nights. In a separate entry, aligned with the third year of Philip and the third year of the 246th Olympiad, 247/8, Eusebius notes the actual celebration of the games. The traditional date for the foundation of Rome was 21 April of the year corresponding to 753 BC, according to Varro, 751 BC according to Dionysius of Halicarnassus (see Ch. 2). The year 1000 would therefore have begun between 247 and 249. The *Historia Augusta* (The Gordians, 33. 3) dates the games to the consulship of the two Philips (father and son), AD 248. The new millennium, the year 1001, will then have begun in the following year AD 249. It is striking that Hakob Ghrimetsi dates the epoch precisely to the Christian year 249. I shall return in the last chapter to the question of how Ghrimetsi and other Armenian authors came to have a Christian era apparently in agreement with that of Dionysius Exiguus.

With one exception, no Greek or Latin source uses the millennium of Rome as a point from which to reckon dates or compute intervals. Grumel (1958: 149–50) has plausibly argued that such an epoch underlies a curious passage in the *Chronicon Paschale.* At the 35th year of Justinian, the chronicler notes (686. 19–687. 10) the completion of a full Paschal period of 532 years since the Passion. He takes the fifth year of Philip as a starting point for the calculation, which he synchronizes with the consulship of Decius and Gratian (250) and with the first year of the 257th Olympiad (249/50). From the fifth year of Philip, the chronicler counts 218 years back to the 19th year of Tiberius, the year of the Passion, which he synchronizes with the fourth year of the 202nd Olympiad (32/3). He then counts 65 years forward to the eighth year of Constantine, the consulship of Volusianus and Annianus (314) and the first Indiction (312/13), and 249 years from there to the 35th year of Justinian, the 10th indiction (561/2), so that the total from the year of the Passion to the 35th year of Justinian is 532 years ($218 + 65 + 249 = 532$). The chronicler's date for the Passion (415. 9–13, 422. 20) corresponds to 30/1. From that date the interval of 218 years leads to 248/9, the correct date for the fifth year of Philip. The interval of 249 years between a first indictional year and a tenth indictional year is also correct. The interval of 65 years, however, yields 313/14 for the first Constantinian Indiction, instead of the correct date in 312/13. The chronicler's alignment of Olympiads and Roman consular years with each other and with his indictional dates is erratic. Only the indictional dates are reliable. He dates the Passion to a fourth indictional year (415. 11–12). From a fourth indictional year in 30/1 to a tenth indictional year in 561/2, the interval is 531 years, not 532.

What is relevant here is that the *Chronicon Paschale* counts the epoch from the fifth year of Philip, the correct date of which is 248/9. The Armenian tradition agrees on the absolute date, but incorrectly synchronized the millennium of Rome with the first year of Philip and the year 1001 with his second year. The appearance in the *Chronicon Paschale* of such an epoch shows that it was not an Armenian invention. The singularity of the passage and its connection with an interval of 532 years suggests that the epoch originated in a Paschal calculation. Aeas of Alexandria is a good candidate for its source.

v. The Georgian *K'ronikon*

Closely related to this era of the Romans is a 532-year period referred to by the Greek loan-word *k'ronikon*, which was used for historical chronology in Georgia. The *k'ronikon* is analogous to the Armenian era, except that its year 1 corresponds to 248/9 and the numbering begins anew after the completion of a 532-year period.

On the north wall of the ruins of the famed Bagrati cathedral in the town of Kataisi, there is an inscription stating that the floor was laid 'in the year 223 of the *k'ronikon*' (Silogava and Schrade 1996). Such dates also appear on coinage of the Georgian kingdom in the twelfth century. Coins of Queen Tamar (1184–1210) carry the legend '*k'oronikonsa* 407' (Turkia 2005).

The base-date of this reckoning can be inferred from a Georgian chronicle published in 1830 by M. Brosset, which expresses dates by reference to the *k'ronikon* and the Byzantine year of the world.[20] One entry informs the reader that in the year 46 of the *k'ronikon*, 6334 of the world, 29 January, Aschod was killed by the Mongols. Another dates the conversion of Russia to the year 208, 6496 of the world. These synchronisms show that the *k'ronikon* began in the Byzantine year 6289. The Byzantine era corresponds to 5509/8 BC (see Ch. 13). The year 6289 was therefore AD 780/1. Thus the Bagrati Cathedral was built in 1002/3. Queen Tamar's coin was issued in 1186/7, Aschod died in 825/6, Russia was converted in 987/8. If one *k'ronikon* began in 780/1, the previous period would have begun 532 years earlier in 248/9, the same year as the Armenian 'era of the Romans'.

Earlier texts associate the *k'ronikon* not with the Byzantine era, but with a cosmic era corresponding to 5604 BC. In the colophon to a tenth-century copy of the *Gospels of Jrutchi*, the scribe identifies himself as Shatberdi, writing in the year 6540, *k'ronikon* 156.[21] With a base-date in the Christian year 781, *k'ronikon* 156 is AD 936, and the cosmic era corresponds to 5604 BC. Another colophon is signed by Ivane Sapareli: 'the year from the creation was 6572, *k'ronikon* was 188'.[22] A tenth-century calendar includes two 19-year cycles ending with the Paschal full moon of 25 March in the year 6422 of the world.[23] 6422 is an exact multiple of 19 and is consistent with a year 1 equivalent to 5604 BC. By that synchronism, the year 6422 would correspond to AD 818.

Grumel (1958: 150–1) rightly connected the Armenian era of the Romans with the Georgian *k'ronikon*, but wrongly found their origin in his erroneous reconstruction of the cycle of Andreas of Byzantium. He argued that Andreas reformed the cycle of Anatolius so that the new cycle began not with 4 April 353, but with 13 April 344. Since that date was not memorable in any way,

[20] Brosset 1830: 264, 295; Dulaurier 1859: 172.

[21] Tbilisi H-1660, description at http://www.manuscripts.ge/en/manuscript.asp?man_id=11, accessed 13 Apr. 2006.

[22] Tbilisi H-2124, www.manuscripts.ge/en/manuscript.asp?man_id=13, accessed 13 Apr. 2006.

[23] Brosset 1868: 19–20; Grumel 1958: 152.

Andreas or someone working with his cycle decided to generate a new epoch beginning 95 years earlier and coinciding approximately with the millennium of the city of Rome. When Theodosius in the 380s made the Alexandrian cycle the official system of the Empire, the cycle of Andreas fell into disuse and with it the epoch of the year 249, except in peripheral areas such as Armenia and Georgia. From this era of the Romans, according to Grumel, the Georgians later generated a cosmic era corresponding to 5604 BC so as to have an era of their own after the example of the Armenians, the Byzantines, and the Alexandrians.

There is no evidence to support Grumel's hypothesis that Andreas of Byzantium was the source of the 19-year cycle beginning with the Paschal full moon of 13 April. The earliest evidence for that cycle is the Armenian era corresponding to 552/3 and the statement of the anonymous Armenian text that Aeas of Alexandria generated a 532-year period beginning with 13 April. It is likely therefore that both the era of the Romans and the cosmic era of 5604 BC corresponding to it also arose with the work of Aeas. Indeed, one of the issues between Aeas and Irion seems to have revolved around the era of creation and how the Christian era of the Incarnation should be calibrated with respect to it.

vi. The cosmic year 5600

One of Anania's complaints against Irion is that he reckoned 5500 years from the creation to Christ (Conybeare 1897: 582). The anonymous text contains a fuller statement:

> Calculating the sum of the years since the beginning, according to his own peculiar doctrine, he [Irion] counted 5500 years to the birth of Christ, taking as a foretype the ark of the covenant of Moses, which was 2½ cubits long, 1½ cubits wide, and 1½ cubits high. He did not take into account the careful investigations of Eusebius and Andreas, who had themselves somewhat different systems. Eusebius explains the reason. There are three different counts of the years before Abraham, according to the Hebrew [i.e. Samaritan], Jewish, and Septuagint texts. They count from Adam to Moses 3689 years according to the Septuagint, 2454 according to the Jews, 2753 according to the Hebrews (i.e. the Samaritan Pentateuch), with no agreement among them. Andreas, however, reckoning the remainder of the time according to the Septuagint, has it right. He counts 5600 years to the birth of Christ, which makes a total to the beginning of our era of 6153 years, during which period the cycles of 19 and 7 and the changes of the seasons complete their regular revolutions. (Dulaurier 1859: 61.)

Anania says that Aeas was true to the ancient traditions of Anatolius and Andreas in every respect except that he placed 25 March at the head of the cycle, instead of 4 April. He criticizes Irion for insisting on an interval of 5500 years to the Incarnation. Aeas must therefore have used the 5600-year interval that the anonymous author attributes to Andreas.

Confirmation that the 5600-year interval was the work of Aeas comes from the colophon to an Armenian translation of the homilies of John Chrysostom written by the Catholicos Petros Getadardz (Matenadaran MS 988). Petros attributes the chronology to the 36 sages who met in Alexandria—clearly a reference to the conference of Aeas. In the translation of Timothy Greenwood (2003*a*, #110), the text reads as follows:

> These divinely-inspired words were written in Armenian era 495, in indiktion of the Romans, the thirteenth year, in the kingship of Monumax emperor, now of our illumination, seven hundred and forty four, and from the virgin Birth, one thousand and forty five. Now if you wish to search for the true total of creation from Adam until the birth of Christ, it is 5420 years; in adding the era of Rome, that is to say 180, it becomes 5600 which are 10 cycles and 280 years. That accurate chronology according to the Dionysian cycle through the rotating motion, since all chronologies tally imperfectly with one another apart from the Dionysian cycle, which the 36 philosophers established in Alexandria.

The year 495 of the Armenian era would correspond to AD 1046, by which time 1 Navasard has receded to 10 March. A thirteenth indictional year, however, corresponds to 1044/5; and it is to the year 1045 from the Incarnation that Petros dates his work. He was in Constantinople at the time that he translated this text, and that fact explains his use of an indictional date. Aristakes of Lastivert says that Petros went to Constantinople in the Armenian year 493 and stayed there for three years before being permitted to take up residence in Sebaste (pp. 62, 89 Bedrosian).

There is an error in the text. Petros counts 5600 years as consisting of 10 cycles plus 280 years. In the previous phrase he should therefore have expressed the interval as $5320 + 280$, instead of $5420 + 180$. What he means here by ‘the era of Rome’ is unclear. Perhaps the 11th 532-year period, beginning in the year corresponding to 284 BC, is the era of the Roman empire.

Petros attributes this interval of 10 cycles plus 280 years to the 36 philosophers at Alexandria. He says that it was the Dionysian cycle that these scholars established. It is possible that Petros became familiar with the cycle of Dionysius Exiguus while in Constantinople. The Dionysian cycle carries at its head the Alexandrian date of 5 April that the Armenians did not recognize as traditional. It is unlikely, therefore, that the Catholicos would have regarded the cycle of Dionysius Exiguus as inerrant. Perhaps, like the preface to the 95-year table published by van de Vyver (1957), Petros attributed the ancient cycle to Dionysius of Alexandria (see Ch. 9).

Years counted from the creation appear only rarely in Armenian texts, and they reflect no consistent cosmic era. Only three such intervals are attested in the texts that Dulaurier collected (1859: 275, 252, 281). They yield dates corresponding to 5199 BC, 5278 BC, and 5424 BC. A few more examples appear from among the Armenian colophons. Of the one hundred colophons translated by Greenwood (2003*a*) and dated between 311 and 548 of the Armenian era, only four also give a count of the years from Adam. They yield dates for the creation corresponding to 5207 BC, 5509 BC, 5320 BC, and 5424 BC.

Although the Armenians did not adopt a cosmic era corresponding to 5604 BC, Petros's attribution to the conference at Alexandria of a 5600-year interval from Adam to Christ shows that the Georgian era of creation was not a late invention. Evidence for the use of a cosmic era corresponding to 5604 BC outside of Georgia has recently been found in an inscription from a funerary chapel at Beit Safafa near Jerusalem (Di Segni 1993). The inscription is dated to the month of June in a 14th indictional year and the year 6200. Counted from 5605/4 BC, the year 6200 corresponded to 595/6, which was a 14th indictional year.

vii. The Work of Aeas

The pieces of the puzzle begin to fall into place on the hypothesis that Aeas and his colleagues decided to correct the Christian era of Annianus at the same time that they recalibrated his 532-year Paschal period. The 19-year cycle of Annianus beginning with a 14th day of the moon on 5 April in a year corresponding to the first year of Diocletian produced a cosmic era of 5492 BC, with a Christian era beginning in the year 5501, AD 9. It carried a date for the Resurrection on Sunday, 25 March, at the beginning of the cosmic year 5534, AD 42, in the 19th year of Tiberius (see Ch. 16). This system required a distortion of Roman chronology, in order to bring 25 March in the 19th year of Tiberius down from its correct date in AD 33 to AD 42 and the cosmic year 5534.

Now that the beginning of the seventh millennium in the cosmic chronography of Africanus had passed, Aeas decided to abandon the notion that the year 5500 should have mystical significance. He adopted instead a number with strictly mathematical symmetry. An interval of 5600 years consists, as Petros Getadardz points out, of ten full 532-year periods plus 10 complete 28-year solar cycles. The year 5601 would appear at the beginning of a cycle and mark the year 1 of a new Christian era.

Working with the Roman calendar, Aeas recalibrated the 532-year period to make it begin with epact 1 on 1 January, with the Paschal full moon on 13 April. With the year corresponding to AD 249 numbered as 5853, the first year of the twelfth period, the year 5601 corresponded to 4 BC and the year 1 to 5604 BC, with the Paschal full moon on 13 April. The full moon of 13 April is too late for the moon of creation, which should have been full about the time of the equinox. The calendar of Aeas began on 1 January of 5604 BC, but the creation had taken place proleptically on what would have been Sunday, 19 March of 5605 BC, with the moon created on 22 March in its eleventh day and full on 25 March.

This difference between the moon of creation and the Paschal full moon of the first calendar year accounts for the variation in our sources between 25 March and 13 April as the head of the cycle. The 25th of March was the first year of the 19-year cycle, with the *saltus* appearing at that point, while 13 April was the beginning of the 532-year period. Hence the Georgian cycle began with 13 April and ended with 25 March, as the fragment from a tenth-century calendar attests. The Syriac fragment also attests to such a cycle. The cycle of the Nestorian churches, however, began with 25 March.

In this chronology, the Incarnation and Nativity would have been dated to the year corresponding to 4 BC. In that year, the now traditional date of the Incarnation on 25 March would have been a Sunday. That date also fits well with what had been the traditional date of the Passion before the time of Annianus—the date of Julius Africanus in AD 31 (see Ch. 17). Africanus accepted the short chronology for the ministry of Jesus (see Ch. 14) and dated the Incarnation to 1 BC. Aeas and his colleagues followed the long chronology and moved the Incarnation to 4 BC. Conceived on 25 March of 4 BC and born either on 25 December of that year or 6 January of 3 BC, Jesus was 31 years old at the time of his baptism in the 15th year of Tiberius, AD 29, and 33 years old when he was crucified.

When Aeas and his colleagues were at work in the 540s or early 550s, the 12th 532-year period since creation was in progress, having begun in the year corresponding to AD 249 and the year 1001 since the founding of Rome. Aeas thus created a new 'era of Rome'. He generated his own 532-year period beginning in 248/9. The Georgians adopted that date as their national epoch, while the Armenians generated their own version beginning 304 years later, 552/3.

4. THE CYCLE OF ANANIA

A 532-year period that began with the full moon of 4 April in the tenth year of the Armenian era, AD 562, was the work of Anania, not Aeas. Anania may also have been responsible for the most commonly attested era of creation in

Armenian texts—that corresponding to 5424 BC. There is an interval of 5985 years between the two dates—a multiple of 19.

It is clear from his preface that Anania intended to restore 4 April to its place of privilege as the head of the ancient cycle. He did not, however, change the position of the *saltus* or alter any of the dates for the Paschal full moon. He says that the cycle of Aeas was correct in every detail except that it began with 3 Nisan. Later Armenian tradition, including the anonymous text that offers another version of Anania's account, wrongly attributed the 532-year period beginning with 4 April to Aeas and concluded that there had been nine years of confusion between the end of the list of Andreas and the time that Aeas and his colleagues met in Alexandria.

The 532-year cycle itself is not included in the manuscript that carries the preface. The text ends with a statement that a 532-year period follows, beginning in the year 828:

> And for as much as not many are skilled in numbers, especially those who are given to edifying, and the teaching of our Lord has been spread over and has taken possession of all the world, for this reason <I shall> compute a period of 532 years according to the reckoning of the Alexandrians from the 828th year up to the year 1360; for those who shall be on the earth, I Anania, son of John of Shirak, have constructed <this cycle> and have put down separately one by one the whole 532 years, in 28 canons, in which I have included the entire number, 532 sequences, and have divided off each separate rule to each separate year. (Conybeare 1897: 584.)

Grumel (1958: 143) interpreted the text as meaning that the 828 years are counted 'according to the reckoning of the Alexandrians'. He suggested that the base-date was the beginning of the eleventh 532-year period of Annianus, at the year corresponding to 172 BC. The year 828 would have been the end of a previous cycle, with the new cycle beginning in 829, which would have been AD 657, 95 years after the beginning of the table supposedly produced by Aeas, which was in turn in the 10th year after the end of the table of Andreas, or AD 562.

The year 657 has a 14th day of the moon on 4 April and is about right for the period when Anania was at work. Nevertheless, Grumel's suggestion is certainly wrong. The Alexandrian cycle of Annianus had a base-date with the Paschal moon falling on 5 April. Anania insists that a Paschal table should properly begin with the Paschal moon of 4 April. Furthermore, he objects to the appearance of 5 April as a date for the Paschal moon anywhere in the cycle. It is therefore not credible that he should have chosen to number the years according to an Alexandrian base-date that carried the Paschal moon of 5 April at the head of its cycle. Moreover, the text states that the cycle begins with the year 828—not 829 as Grumel's hypothesis requires.

Fragments of Anania's 532-year perpetual calendar are extant separately from the preface. A. G. Abrahamyan published in classical Armenian (Yerevan 1944) a reconstruction of the 532-year table as an appendix to his edition of the preface of Anania. He published a modern Armenian version in 1979. As reconstructed, it is organized as nineteen 28-year canons, instead of twenty-eight 19-year canons. Each 28-year canon is doubled. The first expresses dates in the mobile Armenian calendar, the second the equivalent dates in the fixed Roman calendar. The published table begins from the Armenian year 1, with a 14th day of the moon on 13 April, rather than from Anania's favoured date in the 10th year of the Armenian year, with a Paschal full moon on 4 April. The first set of canons is numbered from 1 to 532, the second set from 553 to 1084. The latter set of numbers was supplied by Abrahamyan and is not in the manuscripts. The data include the lunar epact, defined as of Epiphany in the Armenian calendar; the Alexandrian epact expressed in the Roman calendar; the date of Epiphany beginning with 30 Arats in the Armenian calendar, fixed at 6 January in the Roman calendar; the date of the seventh Sunday before Easter (Great Barekendan, the last day before the Lenten fast); the date of the vernal equinox beginning with 13 Ahekani in the Armenian calendar, fixed at 20 March in the Roman calendar; and the dates for the Paschal full moon and Easter Sunday, beginning with 7 and 14 Mareri in the Armenian calendar, 13 and 20 March in the Roman calendar.

This data is for the Armenian year 1, corresponding to 552/3. In every year, Epiphany will correspond to 6 January and the equinox to 20 March, but the dates in the Armenian calendar will advance by one day every four years, because of the lack of leap year in the Armenian calendar. Thus Epiphany is 30 Arats in the year 1, but 1 Mehekan in the year 5. The numbers from 1 to 532 represent the number of Epiphanies elapsed, rather than the number of the year of the Armenian era in the mobile calendar. According to Grigor Broutian (1997: 509), when 1 Navasard in the mobile calendar had receded to the equinox, some calendars noted both the number of the Armenian mobile year and the number of the year in Anania's list.

The oldest manuscript of this perpetual calendar dates from the tenth century, and pages are missing from both the beginning and the end. Grigor Broutian has argued that the original work of Anania from which this manuscript was copied began with the second 28-year canon in the Armenian year 29, 580/1. In that year the 14th day of the moon was on 4 April, the date that Anania defends in the preface as the proper head of a cycle. Broutian finds confirmation in the statement of the preface that the 532-year calendar was numbered from 828 to 1360, 'according to the Alexandrians'. In his opinion, this Alexandrian epoch was the era of Diocletian corresponding to

284/5, but Anania chose to count the years from a point 532 years earlier, corresponding to 248/7 BC. Thus the year 828 was 580/1.[24]

Broutian's hypothesis is attractive, but suffers from the same failings as Grumel's. There is no parallel for an Alexandrian era counted from 532 years before the era of Diocletian, nor is it likely that Anania would have chosen an Alexandrian epoch that produced a cycle with 5 April at its head. Furthermore, the description of the 532-year cycle in the anonymous text suggests that it began with 4 April in the tenth year of the Armenian era.

The phrase 'a period of 532 years according to the reckoning of the Alexandrians from the 828th year' at the end of the preface of Anania may refer to the 532-year period itself, rather than to a base-date for an Alexandrian numerical scheme. In fact, the year 828 makes sense if the author meant the year 828 from Christ. As I shall argue in Ch. 18, the Armenians numbered the year 1 of the Armenian era as the year 553 from Christ, beginning 11 July AD 552. The year 828 from Christ would therefore have been the Armenian year 276, beginning 4 May AD 827. The Paschal full moon in that year according to the Anatolian cycle would be on 4 April 828. The year 828 corresponds cyclically to the first year of the cycle of Anatolius, with its base-date in the year corresponding to AD 258 and with a calculated Paschal full moon on 4 April, which was the date Anania preferred for the head of the cycle. The year 828, corresponding to the Armenian year 276, is also 266 years, exactly one-half of a full Paschal period, after the year 562, the 10th year of the Armenian era, in which the 532-year cycle was supposedly established.

The cycle beginning in 828 was the work of a redactor or continuator. Anania himself probably generated a 532-year table beginning with 4 April 562, numbered perhaps from the Armenian year 10 and the Christian year 562. His redactor or continuator produced a new table beginning 266 years later and edited the text accordingly. How Anania or his continuator came to have a Christian era apparently in agreement with that of Dionysius Exiguus is a question to which I shall return in the last chapter.

5. ARMENIAN EASTER

The Georgian church eventually accepted the Byzantine dates for the Paschal full moon, including that of 5 April. The Armenians, however, along with the Jacobite and Nestorian churches, maintained their allegiance to what they thought was the ancient cycle of Anatolius, Andreas, and Aeas, with the 14th

[24] Broutian 1997; email correspondence dated 6 and 12 Dec. 2006.

day of the moon on 6 April in what was the first year of the classical Alexandrian cycle. The disagreement affects the date of Easter whenever 5 April falls on a Saturday in the relevant year of the cycle. This happens on four occasions in the 532-year period, at the years corresponding to 570, 665, 760, and 1007, and at 532-year intervals thereafter.

Kirakos tells a typical story (pp. 177–8 Bedrosian). He says that work to build the Church of St John the Baptist at Nor-Getik began in the year 640 and was completed five years later 'during the disturbance of Greek Easter'. The year 640 of the Armenian era corresponds to 1191/2, and five years later, in 1197, 5 April fell on a Saturday. Kirakos says there was a fierce dispute between the Armenians and other peoples, especially the Georgians, about the true date of Easter in that year. To explain the reason for the dispute, he repeats what he said earlier in his work about Irion's introduction of false dates into the Paschal calendar. On the occasion in question, Queen Tamar of Georgia sent a Georgian prince and an Armenian representative to Jerusalem to learn the truth. The matter was to be decided by the lamp at the Church of the Holy Sepulchre, which God causes to light up, without aid of human hands, each year at Easter. When Greek Easter arrived, the lamp failed to illuminate. The following week, however, at about the tenth hour, the lamp was lit. Now everyone jeered at the Greeks, and the faith of the Armenians was greatly strengthened.

The miracle of the Holy Fire continues to attract pilgrims to Jerusalem each year on Great Saturday in the Orthodox calendar (Auxentios 1995). The dispute over *crazatik* (crooked Easter) has also continued into modern times (Sanjian 1966: 43–7). In Jerusalem in 1634 the Greeks attempted to force the Armenians to observe Easter on 6 April. Military intervention by the governor of Damascus was required to protect the Armenians and enforce separate celebrations. In 1729, the Greek and Armenian patriarchs in Jerusalem agreed to hold separate observances. Easter of 1824 passed peacefully. The Armenians capitulated and agreed to observe Easter on 6 April. The next occasion will be 2071.

13

The *Chronicon Paschale* and the Origins of the Byzantine Era

1. THE GREEK PASCHALION

The 532-year *Paschalion* of the Eastern Orthodox churches is a variant of the classical Alexandrian cycle. Both cycles have the same sequence of Paschal full moons. The systems differ in that the Byzantine 19-year cycle has its first year corresponding to the fourth year of an Alexandrian cycle. Since the dates for the 14th day of the moon agree, the 12-day 'leap of the moon' that occurs after the last year of the Alexandrian cycle appears at the end of the 16th year in the Byzantine cycle. The years of the cycle are numbered from a theoretical era of creation beginning 1 September of 5509 BC, sixteen years earlier than the Alexandrian era of Annianus and Panodorus. This date has come to be known as the era of Constantinople or the Byzantine era.

The Alexandrian cycle was constructed such that the numbered years of Diocletian, or the cosmic years numbered from 5492 BC, divided by 19 yield as a remainder the position of the year in the lunar cycle of Alexandria. Similarly, the cosmic years of the Byzantine cycle when divided by 19 yield as a remainder the position of the year in the lunar cycle of Byzantium. In both systems, the numbered years of the table—from Diocletian or from creation—are such that leap years can be factored by the number 4. The Byzantine system offers the additional advantage that the cosmic year 1 corresponds cyclically to the first year of the 15-year cycle of the Indiction. Therefore the cosmic year divided by 15 yields as a remainder the number of the year within the cycle of the Indiction.

The modern difference between Western and Eastern Orthodox dates for Easter has nothing to do with the difference between the Alexandrian and Byzantine cycles. The disagreement rather derives from the fact that the Byzantine cycle, based on the Julian calendar, remains in effect in the Eastern Orthodox churches. The Western calculation follows the reformed Gregorian calendar and a revised version of the 19-year cycle in which the 532-year period is no longer valid. To determine the date of Orthodox Easter, one first finds the date in the old Julian system, then converts it to the modern calendar.

Ten days were omitted from the calendar at the time of the Gregorian reform, and another three days of difference have accrued since that time.

Thus 21 March in the Julian calendar is now 3 April in the Gregorian calendar. The year 2008, for example, is the 14th year of the classical Alexandrian cycle, the 11th of the Byzantine cycle, with a 14th day of the moon on Friday, 12 April, Easter on 14 April. Those dates correspond to 25 and 27 April in the new calendar. The western date follows upon a modern calculation for the 14th day of the moon on or after the equinox, still defined as 21 March. In 2008, that date is Saturday, 22 March, so that Easter falls on 23 March.

At an Inter-Orthodox Congress in Constantinople in May of 1923, the delegates adopted a new calendar on the basis of a proposal by the Serbian geophysicist Milutin Milanković (1924). The leap-year rule for century years is different from that of the Gregorian calendar, so that the reform is not the 'Papal calendar'. The two systems agree, however, until the year 2800. The congress also adopted a rule that Easter should be determined in reference to the astronomical full moon at the longitude of Jerusalem. The Greek church adopted this New Calendar, but some churches did not. In the interests of unity, the Greek church decided to abandon the astronomical method for determining the date of Easter and to follow the older system.

The World Council of Churches and the Middle East Council of Churches jointly sponsored a consultation 'Towards a Common Date for Easter', in Aleppo, Syria, in March of 1997. The participants recommended that all Christian churches adopt a common method for determining the date of Easter on the basis of astronomical calculation of the first full moon after the equinox at the meridian of Jerusalem, with effect from Easter of 2001.[1] That expectation proved too optimistic. The 9th Assembly of the World Council of Churches, meeting in Porto Alegre, Brazil, in February 2006, expressed the less ambitious hope that by the time of the 10th Assembly, in 2013, the WCC should have made 'substantial progress' towards agreement among all the Christian churches for a common date for Easter.[2]

2. EVIDENCE FOR THE BYZANTINE CYCLE AND ITS ERA

i. The 532-year table of Johannes

The full Byzantine cycle of 532 years first appears in a manuscript of the eleventh century, attributed to one Johannes, who bore the title of 'arch-presbyter' and

[1] 'Towards a Common Date for Easter', World Council of Churches, Geneva 1997, http://www.wcc-coe.org/wcc/what/faith/easter.html, accessed 18 Apr. 2006.

[2] Press release 24 Feb. 2006, 'Policy committee seeks to strengthen common calling', http://www.wcc-assembly.info/en/news-media/news/english-news/article//policy-committee-seeks-to.html, accessed 18 Apr. 2006.

prepared the document for Bishop Nicolaus of Janne (Castro Giovanni in Sicily). Ferdinand Piper (1858: 120–4) rediscovered this text in Hamburg in the 1850s. The table covers the period, as numbered in the first column, from 6385 to 6916. The second column numbers the years from 877 to 1408 since the Incarnation of Christ. The first year is marked as year 1 of the sun, year 1 of the moon, with epact = 3, in the 10th year of an indictional cycle. The 10th year of an Indiction would correspond at the relevant period to AD 876/7, which is the fourth year of the Alexandrian cycle. The year 1 for Johannes therefore corresponded to 5509/8 BC. Not surprisingly for a Sicilian document, Johannes uses the western epact defined as of 22 March, instead of the Byzantine epact at 1 January. His year 1 of the Incarnation is also western, corresponding to the Christian era of Dionysius Exiguus. Other Byzantine texts date the Incarnation two or three years earlier. George Cedrenus (i. 321. 1) dates the Nativity to the Byzantine year 5506, corresponding to 4/3 BC.

ii. Documentary Evidence

The earliest known official use of the Byzantine era appears in a document of the so-called 'Trullan Synod', which met in Constantinople in a dome-shaped room (*trullus*) of the palace of Justinian II. Canon 3 equates 15 January of the year 6199 with a 4th indictional year.[3] A 4th indictional year would correspond to AD 690/1, so that the year 1 was 5509/8 BC.

Epigraphic evidence for the use of the Byzantine era dates from about the same time. An inscription at Athens dates the death of the bishop Andreas to Wednesday, 15 October, in a 7th indictional year and the cosmic year 6202.[4] A dedicatory inscription on a monastic chapel near Mt. Nebo is dated to 6270, 15th Indiction (Piccirillo 1994). The inscription at the Church of the Mother of God at nearby Madaba reads 'February 6074, 5th Indiction'. Leah Di Segni (1992) has proposed correcting the numeral to 6274. The Trullan document and the inscription at Athens imply a Byzantine year counted from September of 5509 BC. If the cosmic year 6274 was still in progress in February of a fifth indictional year, AD 767, Di Segni's reading requires an epoch corresponding to March of 5508 BC.

iii. Literary Evidence

The earliest literary references come from two approximately contemporaneous texts written about fifty years before the earliest documentary evidence.

[3] *Sacrorum Conciliorum Collectio*, xi. 941; Ginzel 1906–14: iii. 292; Rühl 1897: 196.

[4] *CIG* iv. 9350; Serruys 1907*a*: 185; Ginzel 1906–14: iii. 292 n. 3.

These are the Paschal computus of Maximus the Confessor and a treatise on 'How to compute the 14th of the Pascha' attributed to 'George, monk and presbyter'.

George the monk and presbyter wrote in the year that he designates as the 12th of an Indiction, the 29th year of the emperor Heraclius, and the cosmic year 6147. Franz Diekamp published the text with commentary in 1900. I cite by the pagination of that text. George says (24) that some people count the present year as the 6131st since Adam, but the majority prefer 6147 because of its arithmetical convenience. The number 6147 is divisible by 19 with a remainder of 10, by 28 with a remainder of 15, and by 15 with a remainder of 12. George's cosmic year thus reflects the calibration of cycles that characterizes the Byzantine era, and George comments upon the usefulness of the scheme. He says (27) that the first year of his lunar cycle, in the cosmic year 6138, corresponds to the year 346 from Diocletian. Because the Alexandrian cycle has a base-date corresponding to 1 Diocletian, the year 346 corresponds to the fourth year of an Alexandrian cycle. Since Diocletian 1 = AD 284/5, the year Diocletian 346 = 6138 corresponds to 629/30, and the cosmic year 1 to 5509/8 BC. George's year 6147 corresponds to AD 638/9, which was in fact the 12th year of an Indiction.

Two years later, St Maximus the Confessor wrote his commentary on Paschal calculation. Denis Petau (1630) first published the text, and it was reprinted in *PG* 19. 1217–80. I cite by the numbered columns of that text. Maximus is an advocate of the system that George rejected—a system that Maximus refers to as 'the ecclesiastical tradition' (1234). Maximus synchronizes the 31st year of Heraclius with the 14th year of an Indiction and the year 6133 from Adam (1233). The year 1 for Maximus therefore agrees with that of Annianus, corresponding to 5493/2 BC. Maximus polemicizes at some length against the Paschal cycle and cosmic reckoning of a party of computists whom he calls those who 'multiply the years of the moon five times and six times'. In their system, Maximus says (1227), the 11th year of a lunar cycle corresponds to the fourteenth year of the Ecclesiastical cycle. These *pentaplountes kai hexaplountes* have also, he says (1229), added 16 years to the count since Adam. The cycle and cosmic era of this group are therefore identical with those of George, but there is nothing in George's treatise that corresponds to the fractions of five and six that Maximus criticizes.

The Byzantine era is reckoned from 1 September 5509 BC. A cosmic era counted from 21 March 5509 BC appears a few years earlier than George's tract in the *Chronicon Paschale*. This text presents (32. 1–10) a history of the world from Adam to the 20th year of the emperor Heraclius, a third indictional year, corresponding to AD 629/30. The author dates the Passion (415.

9–15) to Friday, 23 March, in the year that began 21 March of 5540, a fourth indictional year. AD 31 was a fourth indictional year, and in that year 23 March was a Friday. If the year 5540 began 21 March AD 31, the year 1 began on 21 March 5509 BC.

3. THEORIES ON THE ORIGIN OF THE BYZANTINE CYCLE

i. Scaliger, Petau, et al.

Most scholars have believed that the Byzantine era is a purely artificial construct, generated so as to produce precisely the arithmetical convenience upon which George the monk and presbyter remarks.

Joseph Scaliger (1606*b*: 274–5 = 1658: 279–80) thought the Byzantine era had been calibrated to the indictional cycle by the addition of eight years to the cosmic era of Julius Africanus corresponding to 5501 BC.

Denis Petau (1630, *PG* 19. 1408, 1457) attributed the invention of the Byzantine era to the *pentaplountes kai hexaplountes* mentioned by Maximus. Following his lead, Petau argued that the Byzantine era resulted from the addition of sixteen years to the cosmic era of Annianus and Panodorus.

Ludwig Ideler (1825–6: ii. 462) pointed out that the Alexandrian cycle in the form that Annianus gave to it had a base-date with a year 1 corresponding to 5493/2 BC. That year would have been the second of an indictional cycle. To make the first year of a 19-year cycle correspond to the first year of an indictional cycle, one would need to add either 1 to yield a cosmic era of 5494/3 or 16, with a cosmic era of 5509/8. Ideler suggested that the reformers added 16 instead of 1 in order to prevent any confusion between the Alexandrian and Byzantine eras. Franz Rühl (1897: 194) added another explanation. The addition of 1 to the Alexandrian era produces a numbering in which leap-years cannot be factored by 4. Therefore the reformers added 16 years to the Alexandrian era of creation and made what had been the fourth year of an Alexandrian cycle the first year of the new 19-year cycle.

Some scholars, while accepting Petau's argument in principle, have argued that the origins of the Byzantine era must be earlier than the seventh century, earlier even than Dionysius Exiguus.

Joannes van der Hagen argued (1736*b*) that the author of the *Chronicon Paschale* knew of two cycles, one 'according to nature', the other 'according to convention'. The cycle according to nature was the Byzantine cycle, with which the author of the *Chronicon Paschale* disagreed.

Ferdinand Piper (1858: 117–22) believed that the inclusion of the alternative 'circle of the moon' in the Easter table of Dionysius Exiguus was a reference to the Byzantine cycle. That cycle and the cosmic era attached to it must therefore be earlier than the sixth century. He concluded that the cosmic era of the *Chronicon Paschale* was a corrupted form of the Byzantine era.

Rühl (1897: 194–5) suggested that the Byzantine era emerged in stages over some period of time. The cosmic era of the *Chronicon Paschale*, rather than being a variant or corruption of the Byzantine era, represented a preliminary step in the process. Shortly after publishing that book, Rühl (1898) retracted those conclusions. Like Piper, he now argued that the presence of the alternative circle of the moon in the Alexandrian tables of the early fifth century must have been based on a lunar cycle and a cosmic era much older than the *Chronicon Paschale*.

ii. Eduard Schwartz

Schwartz (1899: 2466–73) expanded upon what were now becoming the standard conclusions. Dionysius Exiguus knew of a cycle of the moon beginning in the fourth year of the Alexandrian cycle. Therefore the Byzantine lunar cycle and with it the Byzantine era must have existed no later than AD 525, when Dionysius was at work. Furthermore, since Dionysius apparently found the cycle of the moon already in the version of the Alexandrian table on which he based his work, Schwartz believed that the Byzantine era must have been invented before the end of the fifth century.

Like van der Hagen, Schwartz argued that the author of the *Chronicon Paschale* was familiar with the Byzantine era. He believed that the chronicler used an earlier Paschal chronicle based on this new era, but that he disagreed with some of the dates—in particular, the days of the week—that emerged from this new cosmic chronology for certain events of sacred history. The author therefore moved the date of creation to the previous year, whose dates generated week-days more nearly in accord with the tradition popularized in the chronology of Annianus. The author designated the lunar cycle whose first year coincided with the Byzantine era of creation as the cycle 'according to nature', beginning with the full moon of 2 April. His new cycle, beginning a year earlier with the Paschal moon of 13 April, he called the cycle 'according to convention'.

iii. Daniel Serruys

Serruys (1907*a*) agreed with Petau that the Byzantine era was the invention of the *pentaplountes*, who added 16 to the Alexandrian years of the world to produce the computistical conveniences upon which George the presbyter remarked. The circle of the moon carried in the 95-year table that Dionysius attributes to Cyril, whatever its origin, conveniently provided a precedent for the new cycle. In its earliest form, the new system retained the date of Annianus for the Incarnation in the year corresponding to 5500/01 and AD 9, so that it produced a Christian era corresponding to the year 5517, with the Passion dated to 5550. This innovation must have taken place before AD 629/30, when the *Chronicon Paschale* was written, because the chronicler uses the method of fractional epacts that Maximus attributes to the *pentaplountes* to justify his date for the Passion on 23 March. The author of the *Chronicon Paschale* reduced the date of the Passion to 5540 and the Incarnation to 5507. He introduced a distinction between a cycle 'according to nature', which corresponded to the Byzantine cycle, and a 'cycle according to convention', which began a year earlier with a lunar epact of 0 and marked the true moment of creation. He alternated between the two cycles in his efforts to reconcile different sources and traditions. Serruys noted some verbal correspondences between the *Chronicon Paschale* and the chronicle of Cedrenus. Serruys argued that the source of Cedrenus used the *Chronicon Paschale*, suppressed the 'cycle according to convention', reduced the Christian era from 5507 to 5506, and produced the Byzantine system in its classical form. Cedrenus followed the *Chronicon Paschale* in counting the year from the equinox, on 21 March. A subsequent adjustment moved the beginning of the year from March to September in order to make the cosmic years correspond exactly to the indictional year.

iv. Venance Grumel

Grumel (1958) devoted much of his comprehensive study of Byzantine chronology to the development of an entirely new set of hypotheses about the origins of the Byzantine era and its cycle. Grumel makes much of the distinction between cycles according to nature and according to convention. He also provides a theoretical explanation (1958: 34–5, 47–8, 52–3, 73–4).

The cycle *kata thesin*, according to convention, begins in the year of the creation, when God created the moon in mid-course, there being no actual new moon and therefore no true lunar cycle in that year. The cycle *kata physin*, according to nature, begins in the second year of the cosmos, with the first natural cycle of the moon.

For Grumel (1958: 59, 74–83, 111–12, 156–7), both the cosmic era of the *Chronicon Paschale* and the distinction between cycles according to nature and convention represent a revival of the cycle of Andreas—the reformed cycle of Constantinople that Grumel believes took effect for a brief time during the middle of the fourth century. Grumel argued that Andreas reformed the cycle of Anatolius and gave it a new base-date corresponding to AD 343/4 and a cosmic era at 5510/9 BC. Like Schwartz (1899: 2467) Grumel believed that the author of the *Chronicon Paschale* was reacting against the Christian era of Annianus, with the Incarnation dated to the year corresponding to AD 9 and the Passion to AD 42. The author wanted to restore the traditional date of the Passion in the Greek church on Friday, 23 March of the year corresponding to AD 31, while cleaving as closely as possible to the now also traditional interval of approximately 5500 years between the creation and the Incarnation. These objectives the chronicler accomplished by reviving both the cycle of Andreas and the 'Proto-Byzantine era' based upon it, in which the year 5540 would correspond to AD 31.

Grumel denies that the Byzantine era could have been generated from this Proto-Byzantine era simply by a decision to move the beginning of the year forward from 21 March of the year corresponding to 5509 BC to 1 September of the same year, so as to obtain the coincidence between the indictional year and the cosmic year that is characteristic of the Byzantine era. Insisting that every cosmic era must be based on its own lunar cycle, Grumel (1958: 113–41) finds the rationale for the transition from the Proto-Byzantine era to the Byzantine era in the computistical tract of George the monk and presbyter. George (p. 28) is explaining why the lunar cycle on which the Byzantine era is based begins with eleven epacts of the moon. Both the sun and the moon, he explains, were created on Wednesday. The sun was in the fourth day of its course when created, since the solar cycle must begin on a Sunday. The moon was created in the 15th day of its course, because God created it full. Therefore the difference between the solar and lunar course at the time of creation was eleven days.

This calculation, Grumel argues (1958: 115–16, 124–8), fits the lunar cycle of the Byzantine era well. With the Paschal full moon on 2 April and the 15th day therefore on 3 April, the Byzantine cycle implies a date for creation on 31 March in a year when that date fell on a Sunday. The year corresponding to 5508 BC was such a year. Thus the author of the Byzantine era suppressed the precyclical year of the cycle of Andreas and made the cycle according to nature coincide with the year of creation. The coincidence with the indictional cycle was a fortuitous result of this process, but not its primary motivation. Grumel's hypothesis requires a Byzantine era whose year originally began, like that of the Proto-Byzantine era, in March, rather than on 1 September.

As I have argued in Ch. 5, there is no evidence that Andreas or others working in the 340s or 350s found it necessary to reform the Anatolian cycle in order to account for a change in the standard date for the equinox from

22 March to 21 March. Grumel also distorts the usual meaning in Greek of a distinction between that which is *kata physin* and that which is *kata thesin*. Such a distinction contrasts what is ‘according to nature’ with what is ‘according to convention’. As applied to an Easter cycle, a cycle according to nature should begin with the moon of creation and a cycle according to convention should be based on a civil calendar of one kind or another, whether the Alexandrian calendar beginning with 1 Thoth (29 August), the Roman calendar with 1 January, or the Byzantine calendar beginning with 1 September. Grumel turns this distinction upside-down and makes the cycle according to convention begin with creation and that according to nature in the following year. Why the cycle beginning with the moon of creation should be called *kata thesin*, Grumel never explains, nor does he ever render the phrase in French. The whole theory, whether in Grumel’s formulation or that of van der Hagen, Schwartz, or Serruys, rests on a single, possibly corrupt passage.

Grumel is nevertheless certainly correct in characterizing the cosmic era of the *Chronicon Paschale* as a precondition of the Byzantine era, rather than a corruption of it. It is, however, the author of the *Chronicon Paschale* himself who deserves the credit for the invention of this Proto-Byzantine era—not Andreas of Byzantium.

4. THE CHRONICON PASCHALE

The *Chronicon Paschale* is a history of the world from Adam to the time of the Roman emperor Heraclius. The complete text was first published by Matthäus Rader under the title *Chronicon Alexandrinum* (Munich, 1615). Charles du Cange published a new edition and established the modern title *Chronicon Paschale* (Paris, 1688). The standard edition is now that of Ludwig Dindorf (Bonn, 1832). Joëlle Beaucamp and several colleagues (1979) published a French translation of the prologue, with extensive commentary. Michael and Mary Whitby (1989) published an English translation of the latter portion of the historical narrative, covering the period from Diocletian to Heraclius.

Neither *Chronicon Alexandrinum* nor *Chronicon Paschale* is apt as a descriptive title. The author rejects the Paschal cycle of the Alexandrians, and his own work is not a ‘Paschal Chronicle’. He makes Paschal calculations at the year of the Exodus and for the years of the birth and ministry of John the Baptist and Jesus. Otherwise, there are only two such calculations, both towards the end of the work.

At the seventh year of Phocas, 12th Indiction, AD 608/9, the author comments (697. 18–698. 18) on the tradition that the date of Constantine's death on 22 May coincided with Pentecost. That implies a date for Easter on 3 April, so that 1 April was a Friday. He uses a weekday formula to show that in the seventh year of Phocas, 272 years later, 1 April should be a Tuesday, which is in fact, he says, the case. He designates the seventh year of Phocas as the 19th of a lunar cycle, the year of Constantine's death as the 13th, in which year 3 April is correct as the date for Easter.

At the fourth year of Heraclius, 4th Indiction, AD 615/16, there is a remark (710. 5–711. 4) that 586 years have elapsed since the Resurrection. In the year of the Resurrection, 1 March was a Thursday. Applying the weekday formula, the author finds that 1 March in the fourth year of Heraclius should be a Monday, which is the case. The fourth year of Heraclius is the 7th year of a cycle. Therefore 586 years ago it was the 11th year of a cycle, with the 14th day of the moon on Friday, 23 March. The interval is actually 585 years, but the author works the formulae in such a way as to get the correct results.

i. The Text

The historical narrative carries the title 'Summary of the years from Adam, the first formed man, to the 20th year of the most pious emperor Heraclius, the 19th year after his consulate, the 18th year of the rule of his son, Heraclius Constantine the Younger, the 3rd year of an Indiction'. The indictional date corresponds to the year that began in September of AD 629. The manuscript breaks off in the 18th year of Heraclius.

The first few pages of the text, which would presumably have included the name and circumstances of the author, are also missing from the manuscript. The view of some earlier scholars that the work had originally been composed in the 350s was based on a misunderstanding of some now lost notes by an early editor.[5] Schwartz (1899: 2473–4) argued that the text as we have it is an extension of a work that originally ended with the reign of Justinian. The author states in the prefatory material that he will inform the reader when the first 532-year period since the Passion has been completed and the first year of the second such period has begun. He dates the Passion (685. 7–16) to the year corresponding to AD 31. The second period should thus begin in 563. The author notes that point only 531 years later at the 35th year of Justinian, 21 March, the 10th year of an Indiction, corresponding to AD 561/2.

[5] Conybeare 1906; Mercati 1906; Grumel 1958: 83–4.

The narrative of events after the 35th year of Justinian is sparse, noting only the accession of Justin, Tiberius Constantine, and Maurice. The narrative becomes full again with the murder of Maurice and the accession of Phocas in November of a sixth indictional year, corresponding to AD 602. Schwartz concluded that the principal redaction of the *Chronicon Paschale* ended in 563 and was composed shortly thereafter. Grumel (1958: 111) agreed, suggesting that the author worked shortly after the success of Irion in suppressing the reforms of Aeas and defending the Alexandrian chronology of Annianus (see Ch. 12).

Beaucamp et al. (1979: 284–5) argue for a single recension composed during the reign of Heraclius. Schwartz's hypothesis nevertheless remains viable. In the two calculations that appear toward the end of the work, the numbering of the years within the lunar cycle is consistent with what we find earlier. The phraseology, however, is different. In making calculations for the career of Jesus, the author designates a year as, for example, the 11th within a 19-year cycle. In the calculations at the end of the work, the author designates a year as the '11th indiction of the moon', using the term 'indiction' in the generic sense of a cycle.

A search of the electronic database in the *Thesaurus Linguae Graecae* found no parallel for 'indictions of the moon' elsewhere in Greek literature. The term does appear in a Latin text of the eighth century (Vat. lat. 6018; Chekin 1999). That document numbers indictions of the moon consistent with the Byzantine cycle and with the alternative circle of the moon that we find in the tables of Dionysius Exiguus and Bede. It also numbers the years in accordance with the Byzantine era. The Paschal tables underlying that text seem to have been of the Byzantine type.

It may well be the case that the main body of the work was completed shortly after the death of Justinian in 565. Someone working in the 20th year of Heraclius provided a continuation. Warren Treadgold (2007: 342–3) has recently suggested that the author was an imperial secretary whose personal knowledge of events in Constantinople began about 602, the point at which the narrative again becomes full.

ii. The Cosmic Era of the *Chronicon Paschale*

In general, the author uses years numbered from the creation of the cosmos only to summarize the chronology at the beginning of a patriarch's generation or a monarch's reign. Noah (36. 14) lived 500 years before he begat Shem, the total from Adam being 2162. Jehosaphat (177. 21) was king of Judah for 25 years, total 4595. Cleopatra (355. 3) ruled for 22 years, total 5477. Tiberius (388. 7) was emperor of the Romans for 22 years, total 5543. The last such entry is for the emperor Phocas (694.16), who ruled for three years, for a total of 6119 years. The chronicler offers cosmic dates only in a few other passages, including the date of the Flood, the date of the first Passover observance at the time of the Exodus, certain dates in the careers of John the Baptist and of Christ, and the date of the 20th year of Constantine, which had been the terminus of the *Chronicle* of Eusebius.

In his annalistic narrative, the author dates by regnal years, which he supplements after the period when they respectively begin with numbered Olympiads, the names of the Roman consuls, and numbered indictional years beginning from the first year of Julius Caesar. He dates (191. 12, 193. 15–18) the first Olympiad to the 51st year of Azarias as King of Judah, whose 52nd and last year corresponds to the cosmic year 4733. The beginning of the Roman consular list appears at the first year of the 85th Olympiad (440 BC), and the author says (308. 18–309. 2) that the consuls governed Rome for 394 years, until the first year of Julius Caesar, which was the consulship of Lepidus and Plancus and the second year of the 183rd Olympiad. The standard consular list for the period of the Republic began more than 60 years earlier, about 509 BC. The author's consular list for the period after Julius Caesar is more accurate. The alignment of consular years with Olympiads and indictional years is not always correct. Only the indictional dates are consistently right.

The single best passage for determining the absolute date of the author's cosmic year is his discussion (415. 9–15) of the date of the Passion. The Passion took place in the year that began on 21 March, year 5540 of the Cosmos, the fourth year of an Indiction, on Friday, 23 March. The author names the consuls for the year as Persicus and Vitellius, whose year was AD 34. The fourth indictional year corresponds to AD 30/1, and 23 March was indeed a Wednesday in AD 31. If the year 5540 began 21 March AD 31, then the year 1 began 21 March 5509 BC; 21 March 5509 BC in the proleptic Julian calendar was a Wednesday, the day of the creation of the sun and the moon. The first day of creation was therefore Sunday, 18 March 5509 BC.

That 18 March was the author's date for the Sunday of creation can also be inferred from his formula for calculating the days of the week. He always subtracts three days from the beginning of the year on 21 March and makes his count from 18 March. Thus, for the year 5540, after calculating the solar epact for the year as 7, he says (415. 2–8) one must add the 3 days before the stars and the 3 days from 21 March to 23 March, for a total of 13, which is divisible by 7 with a remainder of 6, showing that 23 March was a Friday, the sixth day of the week. From this and similar examples, it is clear that the author defines the solar epact as of 18 March, the anniversary of the Sunday of creation.

The chronicler's date for the 20th year of Constantine also yields the year corresponding to 5509 BC as his cosmic era. He summarizes the chronology from creation through a series of intermediate points to obtain a total of 5833 years to the 20th year of Constantine, which he equates to the 13th year of an Indiction and the consulship of Paulinus and Julian. Constantine was proclaimed emperor by his troops on 25 July AD 306, and he counted his rule from that date.[6] The 20th year therefore began in July of AD 325. A thirteenth indictional year corresponds to AD 324/5, and the year of Paulinus and Julian was 325. If the year 5834 began on 21 March AD 325, then again the year of creation corresponds to 5509 BC.

The author's date for his contemporary, the emperor Phocas, produces the same result. He says that Phocas became emperor in November of a 6th indictional year and ruled for eight years, ending in 6119. The first year of Phocas was therefore 6112. A sixth indictional year corresponds to AD 602/3. If the year 6112 began on 21 March AD 603, then the year 1 corresponded to 5509 BC.

iii. The Prologue

To this chronographic summary of the history of the world from Adam to his own time, the chronicler prefixed an introduction. The manuscript is defective at its beginning. The introduction begins in the middle of a series of quotations from Scripture, from the Jewish philosopher Philo, and from such Christian writers as Clement of Alexandria, Hippolytus, Athanasius, and Peter of Alexandria. It is because the excerpt from Peter appears at the beginning of the extant text that Matthew Rader entitled the work the *Chronicon Alexandrinum*.

These citations all serve to support the author's contention (15. 14–16. 19) that the Passover must be observed on the 14th day of the first month of the year, but only after the vernal equinox, and that Christ suffered and died as the true Paschal Lamb on the 14th day of the first month. The author states the now standard rule that Easter should be observed on the first Sunday after the Paschal full moon, but postponed for a week if the 14th day of the moon falls itself on a Sunday.

The author then (16. 15–20. 2) congratulates the 318 fathers at Nicaea and the emperor Constantine for establishing the rule that all the church should observe Easter on the same day and in accordance with the practice of Alexandria and Rome. He states that the ancient fathers established the 19-year cycle as the method for determining on which date in the month of March or April the 14th day of the moon occurs. He adds that some people also generated a 95-year cycle, wrongly believing that the calendar dates for

[6] Socrates 1. 1; *Consularia Constantinopolitana*, Mommsen 1892: 231.

Easter Sunday, as well as for the Paschal 14th moon, would repeat every 95 years. Such cycles have even been inscribed, he says, on tablets in many churches. An example from the author's time or earlier survives at Ravenna (see Ch. 4).

Certain churchmen, the author continues (20. 3–22. 18), demonstrated the inaccuracy of the 95-year table as a cycle and determined that a true Paschal period consisted of twenty-eight 19-year lunar cycles, nineteen 28-year solar cycles, for a total of 532 years. Thereafter, many people drew up 532-year cycles, mixing truth with falsehood. Some changed the dates of the 14th day of the moon that had been established by the fathers and introduced their own idiosyncratic 19-year cycles. Others left the ancient dates unchanged, but introduced numbers of years counted from creation, from the Incarnation, or from the Resurrection in such a way as to disagree both with Holy Scripture and with ecclesiastical teaching. He especially criticizes those who disturbed the accepted dates for the Nativity on 25 December, the Annunciation on 25 March, the birth of John the Baptist on 24 June, and the Presentation of Christ in the Temple (Luke 2: 22–9) on 2 February.

The author states (22. 19–24. 5) that he has therefore found it necessary to compose an authentic 532-year cycle, one in agreement both with Scripture and with the tradition of the fathers. To this he says he will prefix the 28-year cycle of the sun 'according to nature', which begins with the creation of the heavenly luminaries, and which shows for each year the epacts of the sun. After that he will also show the 19-year cycle of the moon 'according to nature', which also begins with the creation of the heavenly luminaries. This cycle, he says, shows the epacts of the moon for each year and the dates of the 14th day of the first month, when the Passover of the Mosaic Law should be observed.

The chronicler says (24. 5–25. 22) that he will also show the numbered years of the cosmos and demonstrate methods by which one can take the number of the cosmic year and derive which year it is of the solar cycle, what are the epacts of the sun, and on what day of the week any given date of any month occurs. Similarly (24. 6–20), he will explain methods for deriving from the number of the cosmic year the epacts of the moon and the date in March or April when the 14th day of the first month occurs. After these demonstrations, the author will show in what year of the cosmos and in what year of the solar cycle and what year of the lunar cycle the first Passover in Egypt was observed, with similar calculations for the Annunciation to Zacharias about the birth of the Baptist, the Annunciation to Mary, the Baptism of the Lord, the Resurrection, and the beginning of the second 532-year cycle as counted from the Passion.

The author concludes the introduction (26. 1–29. 22) with a few remarks about the solar and lunar cycles. The solar cycle according to nature begins with no epacts, as the notion of an epact at the time of the creation is laughable. At the beginning of the second 28-year cycle and every such cycle thereafter the epact will be 7. The reader should also note, he says, that every year of the 28-year cycle of the sun according to nature begins from 21 March, the date of the vernal equinox. In his comments on the lunar cycle, the author says that the ancient Hebrews used a lunar calendar and that it was the Egyptians who first adopted a solar calendar. He adds that some people make the mistake of thinking that the first month begins in the wintertime. In truth, he says, the first month must be reckoned such that its fourteenth day cannot precede the vernal equinox, which occurs on 21 March in the Roman calendar, 25 Phamenoth in the Egyptian calendar, and 21 Dystros in the Syro-Macedonian calendar.

iv. Solar and lunar cycles

The promised 532-year cycle and the formulae for calculating epacts and weekdays are missing from the text as we have it. The manuscript does include two 'wheels' at the end of the preface exhibiting, respectively, the 28-year solar cycle and the 19-year lunar cycle. Two more wheels appear within the annalistic narrative. Such wheels present data in a circular form that shows their periodicity.

The first wheel

The first wheel is divided into 28 chords. They are numbered 1–28 in the outer circle. The second circle has a number from 1 to 7, beginning with 2. The innermost circle has a number from 1 to 7, beginning with 6. The legend in the middle of the wheel says that the number shows the weekday for the first day of March. By inspection, we can infer that this statement refers to the innermost circle. The number in the second circle must therefore express the weekday as of the first day of the solar year.

Since the author has said that the solar cycle 'according to nature' must begin on a Sunday with epact 0 or 7 and weekday = 1, the numeral 2 = Monday at the first year of the cycle shows that the cycle begins in the second year of the cosmos. The first year of this solar cycle therefore corresponds to AD 345 and to 5508 BC, with 1 March on a Friday. The beginning of the solar cycle on a Monday corresponds to 18 March, the anniversary of the creation. It also corresponds to the previous 1 October, which later Byzantine authors defined as the beginning of the solar cycle (Matthew Blastares: Letter Pi, ch. 7, l. 313). This is therefore a cycle of the later Byzantine type.

The second wheel

The wheel representing the lunar cycle has nineteen chords and again three circles. The legend explains that these circles show (1) the month, March or April; (2) the day of that month when the 14th day of the moon occurs; and (3) the age of the moon as of 1 January. This cycle also has a base-date corresponding to AD 345, since it begins with a Paschal full moon on 2 April. The dates for the 14th day of the moon are those of the Alexandrian and Byzantine cycle, including 5 April, followed by 25 March and 13 April at the end of the cycle.

The cycle begins with epact 12. The word used is not 'epact', meaning 'additions' of the moon, but *themelion*, meaning 'foundation' of the year. Both this word and the fact that the epact is 12 show that this is a cycle of the later Byzantine type. One can presume that the chronicler believes that the lunar cycle, like the solar cycle, should begin with no epacts. That this presumption is correct follows from the formula that the author uses for calculation of the epact. As we shall see, that formula requires epact 0 at the head of the cycle. In the next year, the epact should be 11. The difference between epact 11 and epact 12 does not produce different dates for the 14th day of the full moon. It rather reflects the difference between making the seat of the epact 1 January, with the age of the moon at 12, and fixing the epact at 31 December, with the age of the moon at 11 days.

Schwartz (1899: 2469) rightly regarded both of these wheels as representing the later Byzantine cycle, rather than the author's own cycles. He considered them the work of a scribe who sought to supply the deficiency in the manuscript.

The third wheel

The third and fourth wheels appear within the main body of the text and represent the author's own lunar cycle, beginning with epact $30 = 0$.

The third wheel appears after p. 372 in the Dindorf edition. It illustrates calculations the author makes for the lunar epact in the month of September to support his argument about the date of the conception of John the Baptist. The first of its nineteen chords is numbered as the year 5492, which corresponds cyclically with the year 1. It begins with epact 30 and ends with epact 18. It also shows the weekday and lunar epact for the first of September, incorporating an arithmetical mistake that the author makes in the text, perhaps intentionally, as we shall see.

The fourth wheel

The author's lunar cycle is best represented in the fourth wheel. It appears after p. 534 in the Dindorf edition, at the consulship of Leontius and Sallustius, AD

344, which corresponds to the base-date of the cycle, according to the legend in the middle of the wheel.

The wheel is divided into 19 chords, with three outer circles and one large undivided inner circle. In the outermost circle is the number of the year in the 19-year period, the epact of the moon, and the date of the Paschal full moon in the Roman calendar. The second circle gives the date in the corresponding Macedonian and Alexandrian months. The third circle numbers the years since Diocletian. The first arc is the 59th year of Diocletian, the 19th is Diocletian 77.[7] The wheel has the same sequence of epacts as in the later Alexandrian cycle, beginning with 30 = 0 in the first year of the cycle and ending with 18 in the 19th year. The 14th day of the moon of the first year is dated to 13 April, to 26 March in the 19th year. Thus, the epact is defined as of 30 March, the lunar equivalent of 31 December of the previous year. As in the classical Alexandrian cycle, the *saltus* appears between epact 18 and epact 30 = 0—that is, between 26 March and 13 April in this Paschal wheel. In the Alexandrian cycle, the *saltus* appears between 17 April and 5 April. Moving the seat of the epact from 26 Phamenoth (22 March) to the previous 31 December, while retaining the number of the epact, produces two differences in the dates for the Paschal full moon. The first year of the cycle corresponds to the third year of an Alexandrian cycle. Therefore all the dates for the 14th day of the moon agree with those of the classical Alexandrian cycle until the 18th year and 19th year, where 6 April and 26 March appear, instead of 5 April and 25 March. Table 11 compares the cycle of the fourth wheel with both the classical Alexandrian cycle and the Anatolian cycle as I reconstructed it in Ch. 8.

In the large inner circle is a descriptive legend, as follows:

> Dates of the 14th moon in the 19-year cycle, when the Pasch is to be observed according to the Law. The wheel has the dates according to the Romans, the Syrians or Macedonians, and the Egyptians. The present 19-year cycle begins from the 59th year of Diocletian, that is, from 21 March, the day of the equinox, in the consulship of Leontius and Sallustius, in which consular year the year 5852 of the cosmos was completed. The 19-year cycle thus finished in the time mentioned and under the consuls named, it returns again to its first year on the 21st day of the month of March in the 2nd Indiction, thus demonstrating that neither an 8-year cycle nor 15 nor 17 nor 16 is accurate, but only one of 19.

The 59th year of Diocletian corresponds to the year 342/3. Leontius and Sallustius appear in the consular lists at the year corresponding to 344. The second year of the Indiction corresponds to the 60th year of Diocletian, AD 343/4. The return of the cycle to its head in the second Indiction must refer to

[7] Dindorf numbers the first arc as Diocletian 79, the second as Diocletian 60, and on through to Diocletian 77. '79' must be a typographical error for '59'.

Table 11. The 19-year cycle in the fourth Paschal wheel of the *Chronicon Paschale*, compared with the classical Alexandrian and Anatolian cycles

Year AD	Diocletian	Roman Epact	Moon 14	Alexandrian Epact	Moon 14	Anatolian Epact	Moon 14
344	60	0	13 April	22	13 April	21	14 April
345	61	11	2 April	3	2 April	3	2 April
346	62	22	22 March	14	22 March	14	22 March
347	63	3	10 April	25	10 April	25	10 April
348	64	14	30 March	6	30 March	6	30 March
349	65	25	18 April	17	18 April	17	18 April
350	66	6	7 April	28	7 April	28	7 April
351	67	17	27 March	9	27 March	9	27 March
352	68	28	15 April	20	15 April	20	15 April
353	69	9	4 April	1	4 April	1	4 April
354	70	20	24 March	12	24 March	12	24 March
355	71	1	12 April	23	12 April	23	12 April
356	72	12	1 April	4	1 April	4	1 April
357	73	23	21 March	15	21 March	15	21 March
358	74	4	9 April	26	9 April	26	9 April
359	75	15	29 March	7	29 March	7	29 March
360	76	26	17 April	18	17 April	18	17 April
361	77	7	6 April	0	5 April	29	6 April
362	78	18	26 March	11	25 March	10	26 March

21 March 344. The cosmic year 5852 is an exact multiple of the great Paschal period of 532 years ($532 \times 11 = 5852$). Therefore, it represents the last year of a cycle and must correspond to the year that began on 21 March of 343, which was within the 59th year of Diocletian. A new cycle began on 21 March in the consulship of Leontius and Sallustius, the second Indiction, AD 344, the year 5853 of the world. As Grumel (1958: 80–2) has pointed out, the segments of the wheel ought to have been labelled as Diocletian 60–78, instead of 59–77. A scribe misunderstood the legend and numbered the sections from 59. If the year 5852 corresponded to the 59th year of Diocletian = AD 342/3, then the year 1 corresponded to 5510/9 BC and actually began on 21 March of 5509 BC.

In Grumel's opinion, this wheel is not the work of the author of the *Chronicon Paschale*, but represents a genuine fourth-century document deriving from the time of Andreas of Byzantium and his supposed reform of the 19-year cycle in the 340s or early 350s. Grumel bases this view on what he considers certain archaic features of the document. These include especially the numbering of the years by reference to Diocletian and the argument in the legend against any cycle other than that of 19 years. By the time that the *Chronicon Paschale* was composed about 630, numbering by reference to Diocletian had gone out of style, in Grumel's view, and there was no longer any debate about which kind of cycle was the most accurate. Furthermore, the legend states that the cycle begins with the consulship of Leontius and Sallustius. No chronicler of the seventh century, seeking to inform his contemporaries, would have dated a cycle to a period nearly three centuries earlier. Therefore, Grumel concludes (1958: 82), whoever drafted the legend must have been living during the course of that 19-year cycle, between 344 and 363.

Grumel's whole theory of reform of the cycle in Constantinople in the middle of the fourth century rests on erroneous assumptions (see Ch. 5). Furthermore, the supposedly archaic features of the fourth Paschal wheel are not archaic at all and do not point to a fourth-century origin for this document. Reference to numbered years of Diocletian in Paschal cycles is not uncommon in seventh-century texts. Maximus the Confessor uses years of Diocletian in some of his formulae (*PG* 19. 1269–72). The author of the *Chronicon Paschale* himself thought it appropriate when noting the accession of Diocletian to inform his readers (611. 3–6) that the years of Diocletian in the Paschal tables are numbered from the consulship of Diocletian Augustus and Aristobulus. The use of a wheel beginning as long ago as AD 344 is explicable by the fact that this is the base-date of the chronicler's cosmic era corresponding to 5509 BC. The cosmic year 5852 marks the end of the 10th period of 532 years since the creation and the beginning of the eleventh period, within which the author is writing.

The cycle beginning with 13 April and ending with 26 March in the fourth wheel of the *Chronicon Paschale* is the author's own invention. It represents a transposition of the Alexandrian epacts such that they begin with epact 30 = 0 defined as of 31 December, the last day in the Roman calendar, instead of the last epagomenal day in the Alexandrian calendar. If it has a precedent, that precedent is rather to be sought in the reforms of Aeas and his colleagues at the conference in Alexandria in the 540s or 550s than in any reform by Andreas or others at Constantinople in the 340s.

As I have argued in Ch. 12, Aeas also adapted the Alexandrian cycle to the Roman calendar. The 19-year cycle began at creation with a 14th day of the moon on 25 March, while the calendar began the following January with a 14th day of the moon on 13 April. Aeas calculated an era of creation corresponding to 5604 BC, using the full moon of 25 March as a base-date. The author of the *Chronicon Paschale* used 13 April as a base-date and calculated a year of creation corresponding to 5510/9 BC, thus adhering more closely to the traditional scheme that allowed 5500 years from the creation to the Incarnation. The choice of 5510/9 also produced a date of Wednesday, 21 March, the vernal equinox, for the creation of the sun and the moon.

v. Formulae

The formulae with their explanations do not appear as promised at the end of the prologue. We can reconstruct them from the calculations that the author makes in the course of the annalistic narrative.

The lunar epact

The formula for calculating the lunar epact is identical with the Alexandrian formula from which Dionysius Exiguus adapted his own (see Ch. 6). Dionysius divides the years of the Lord by 19, multiplies the remainder by 11, then divides the result by 30. The remainder is the epact for the year. This formula works because the epact is $30 = 0$ in the first year of the cycle and advances by 11 in each succeeding year until it reaches $11 \times 19 = 209$ in the last year, at which point the *saltus* intervenes to raise the epact to 210, which is divisible by 30 with a remainder of $30 = 0$. For Dionysius, the numbering of the years of the Lord begins from 532 in the first year of a cycle, so that the year 1 is in the second year of a cycle. Therefore the number of the year divided by 19 yields as a remainder the interval from the first year of a cycle to the year in question and therefore the multiple of 11 to be added. Dionysius must add 1 to the number of the year, before dividing by 19, to find the number of the year in the cycle. For the author of the *Chronicon Paschale*, the epact in the first year of a cycle is also $30 = 0$. The numbering of the years, however, begins from 1 in the first year of a cycle. The computist must subtract 1 from the number of the cosmic year before carrying out the rest of the formula so as to yield the interval from the first year. For both Dionysius and the author of the *Chronicon Paschale*, when the interval is an exact multiple of 19, the remainder is 0; and $0 \times 11 = 0$, which is the epact $30 = 0$ in the first year of a cycle.

An example appears at 395. 14–22, for the year 5537, where the author calculates the date of the first Passover that Christ shared with his disciples. He subtracts 1, divides 5536 by 19, finds a remainder of 7, multiplies by 11 to get 77, subtracts 60, for a result of 17. Therefore the epact for the year is 17, and the author proceeds from there to calculate the date of the Paschal full moon as being 27 March.

The date of the Paschal full moon

The phraseology the author uses for calculating the 14th day of the moon is unique to this text. The chronicler finds the date of the 14th day of the moon by adding numbers to the epact to reach the total of 44. He takes the epact for the year and adds 13 days 'before the luminaries' and 7 'prelunar' days. The total for the year 5537 is $17 + 13 + 7 = 37$. The author then counts 7 days beginning with 21 March as 1 to reach the total of 44 at the date of 27 March.

The constant '$13 + 7 = 20$' represents the differential in the lunar epact between the seat of the epact as of the last day before the beginning of the calendar year on 1 January and the last day before the beginning of the natural, cosmic year on 21 March. Because 1 January and 1 March, being separated by 59 days, share the same lunar epact, the author can more conveniently start his count by adding the 20 days from 1 March to 21 March, instead of counting the days from 1 January. Leap years do not affect the lunar equivalence between 1 January and 1 March, because the 19-year cycle adds a lunar day to match the additional solar day.

Why the author breaks these 20 days of March into '13 before the luminaries' and '7 before the moon' has baffled the commentators. Beaucamp et al. (1979: 296–7) devoted an appendix to the question, but without satisfactory result. Following a suggestion of Petau (1703: ii. 229–30), they explain the 13 days before the luminaries as a way of calculating the day of the new moon, on the assumption that the moon was created full in its 14th day. That assumption does not fit the author's system. Petau had argued that the author borrowed the 13 days from a formula that originally belonged to some other cycle or method of calculation. Accepting that argument, Beaucamp et al. simply point out that an additional 7 days are required to make the formula work.

The phraseology is explicable within the chronicler's own system. The author also uses the phrase 'before the luminaries' in his formula for calculating weekdays. In that formula 'three days before the luminaries' refers to the period between 18 March, the seat of the solar epact, and the creation of the sun on 21 March. In the lunar formula he counts 20 days from 1 March, the seat of the lunar epact. The author's cosmic era entails a date for creation on Sunday, 18 March, and a Paschal 14th day of the moon in the first year of the cycle on 13 April. The moon was therefore in its 21st day when created on 21 March. The '7 days before the moon' count back to what we may call the 'virtual' full moon of 14 March. The remaining 13 days represent the count from 1 March to 14 March.

The solar epact

The formula for calculating the solar epact is again similar to the formula of Dionysius Exiguus for finding the concurrent of the year. Dionysius takes the number of the year of the Lord, adds one-fourth of that number and the constant of 4. He divides the total by 7. The remainder is the concurrent for the year, with Sunday numbered as 1. The number of days in an ordinary year exceeds the number of weeks by 1 ($52 \times 7 = 364$). Therefore the number of the year of the Lord corresponds to the number of weekdays that must be added to the starting point for a 365-day year, and one-fourth of the number corresponds to the extra days added for leap-years. The constant of 4 represents the starting-point.

For the author of the *Chronicon Paschale*, the solar cycle begins on 18 March, the anniversary of creation. He does not need to add a constant, but he must first subtract 1 from the number of the cosmic year. The reason for both of these differences is that he is calculating not the weekday of 18 March, but the solar epact in the more technical sense of that term. The author says in the preface that the solar cycle begins from no epacts. Therefore, the epact of 0 or 7 is a Sunday. To find the solar epact for any cosmic year, one must calculate the interval between the year 1 and the year in question. That interval is expressed as the number of the cosmic year, minus 1.

For the year 5537, the author (396: 1–4) takes 5536 and adds one-fourth of that number for a total of 6920. That number is divisible by 7 with a remainder of 4. The solar epact for the year is therefore 4.

To calculate the weekday for any given date, the author adds the constant of 3 to the solar epact to find the weekday for 21 March and then counts the number of days in the year beginning with 21 March as day 1. This double-counting of 21 March has the effect of adding 1 to the epact to yield the weekday. Thus, at 396. 5–9, to find the weekday for 27 March in the year 5537, the chronicler takes the solar epact of 4 that he has just calculated, adds 3 days before the luminaries and 7 days counted from 21 March for a total of 14. The number 14 is divisible by 7 with a remainder of 7, so 27 March was the seventh day of the week, a Saturday.

For a date later in the year, the author can take advantage of the fact that 18 March and 1 April share the same weekday. He counts the days from 1 April, taken as 1. For the date of the baptism of the Lord on 6 January of the cosmic year 5536, he first calculates the solar epact as 4, then adds the days month by month from 1 April to 6 January for a total of 285. That number is divisible by 7 with a remainder of 5, so 6 January 5536 was a Thursday. Here, as Beaucamp et al. point out (1979: 288), the author has made a mistake. He forgot to subtract 1 from the cosmic year. The correct formula would yield a solar epact of 2 for the year 5536, with 18 March AD 27, on a Tuesday, and 6 January AD 28, also a Tuesday.

It is this requirement for the subtraction of 1 from the number of the cosmic year before application of the formulae that accounts for the chronicler's application of two different numbers to the same year. It has nothing to do with the distinction between a cycle according to nature and a cycle according to convention of which Schwartz, Serruys, and especially Grumel make so much.

vi. The Cycle According to Nature

Grumel (1958: 34) gives his reader the impression that a distinction between a cycle according to nature and a cycle according to convention is something one encounters frequently in late-antique and Byzantine Paschal calculations. In fact, this distinction appears only once, in the *Chronicon Paschale*. Beaucamp et al. (1979: 277–82) state that such a distinction appears explicitly nowhere else in Greek literature. A search of the *Thesaurus Linguae Graecae* confirms that claim. George Cedrenus does refer (i. 307. 10–15) to a cycle according to nature, but there he is only paraphrasing the *Chronicon Paschale* and he does not compare that cycle with one according to convention.

A distinction between nature and convention, or between what is natural and what results from human or (sometimes) divine intervention, is frequent enough in Greek authors. The contrast has its origins in the distinction between *nomos* (law) and *physis*, and various verbal or conceptual equivalents in writers of the fifth century BC (Heinimann 1945). Cyril of Alexandria, among other Christian writers, often asserts that Christ is son of God 'according to nature', while men are sons 'according to grace and *thesis*'.[8] Here *thesis* has the sense of 'adoption'.

By using the phrase according to nature in reference to a cycle the author of the *Chronicon Paschale* implies a contrast with something that is according to human convention. In the prologue he mentions cycles different from his, which err in their dates for the 14th day of the moon or in their numbering of the years from creation. He does not characterize his own cycle as being according to nature in contrast with these competitors. The author defines the cycle according to nature at the end of the prologue—every year of the 28-year cycle of the sun according to nature begins from 21 March, the date of the vernal equinox. The implicit contrast is with solar years of 365¼ days that begin other than with the equinox at various dates according to the calendars of various peoples.

There are indeed several passages in the *Chronicon Paschale* where the author numbers a year differently from what his cosmic era and his definition in the preface of a cycle according to nature seem to require. The two sets of numbers derive from the requirement for the subtraction of 1 in the author's formulae.

In what follows, I transliterate the Greek *enneakaidekaëteris*, instead of translating it as '19-year cycle'. The word means literally 'the 19-year thing' and does not contain the word 'cycle'. For Dionysius Exiguus and his western successors, the *enneakaidekaëteris* or its Latin translation *decemnovennalis* refers to the 19-year cycle that begins with epact 0 in a year corresponding

[8] *Thesaurus de sancta consubstantiali trinitate*, *PG* 75. 469 *et passim.*

to AD 532. It is distinct from the 19-year 'circle of the moon' that begins with epact 3 in a year corresponding to AD 535.

The author of the *Chronicon Paschale* uses the term *enneakaidekaëteris* in two different senses. He is not always careful to distinguish between them, and either he or his copyist sometimes makes a mistake with the associated nomenclature. The two senses of the term can be understood as the *enneakaidekaëteris* according to nature and the *enneakaidekaëteris* that results from calculation.

The year 5540

The author frequently uses the phrase 'according to nature', in reference to an *enneakaidekaëteris* or to the 28-year *octokaieikosiëteris* of the sun. He never uses the phrase 'according to convention'. Such a distinction occurs only in the middle of a long passage (414. 10–415. 8) where the author is discussing the date of the Passion—and there the phraseology is different. The chronicler is instructing the reader how to calculate both the date in the month and the day of the week on which the Paschal full moon occurred in the year 5540 of the cosmos, which, he says, began on 21 March. He subtracts 1 and divides the number 5539 by 19. There is a remainder of 10. Therefore it is 'by nature' the tenth year of the *enneakaidekaëteris*, 'by convention' the 11th year, having 21 epacts.

The text expresses this distinction between nature and convention not by the author's usual prepositional phrase, 'according to nature', with a contrasting phrase, 'according to convention', but with adverbial datives, 'by nature (*physei*)', and 'by convention (*thesei*)'. As Beaucamp et al. have pointed out (1979: 277–82), this departure from the author's usual phraseology underscores the uniqueness of the distinction made here and raises the suspicion that the contrast expressed does not belong to the original text. The adverbial dative 'by nature' does appear, as we shall see, in one other passage (140. 11); but nowhere else does the text enumerate a year 'by convention'.

The text as we have it says that the number of epacts for the year 5540 is 21. As Grumel notes (1958: 79), this number is clearly a mistake. The author has stated (406. 19) for the previous year that the number of epacts is 9. Each year the epact advances by 11, except where the *saltus* intervenes to produce an advance by 12. Therefore the epact for the year in question should be 20, not 21; and 20 is the number that the remainder of the calculation requires.

The author adds to the epact the 13 days before the luminaries and 7 days before the moon to yield a lunar addition of 40. The objective is to reach a total of 44. The 44th day will represent the first 14th day of the moon on or after 21 March. Therefore, the author should add 4 to his total to find that the 14th day of the moon is on 24 March. Indeed, for this year of the cycle—in the

Alexandrian cycle and in the lunar tables of the second, third, and fourth wheels of the *Chronicon Paschale*—the 14th day of the moon does fall on 24 March. The author wishes to show, however, that his date for the Passion on Friday, 23 March, of the cosmic year 5540, was in fact the 14th day of the moon and that Christ died on the cross at the same time that the Paschal lamb was sacrificed in the temple on the afternoon of 14 Nisan.

The author therefore adds 3 to the total of 40 to arrive at 23 March and then employs a calculation of accrued fractional epacts to reach the desired sum of 44. 'We take 22 fractions and add another 45, because it is the third year after the bissextile; and from the 67 *lepta* we make one day and have a total of 44. Divide the 44 by 30, the remainder is 14. Therefore the 14th day of the moon falls on the 23rd day of March.'

This calculation is based on the distribution of the extra day of the *saltus* into annual fractions and on the division of a day into 60 parts. Such divisions, called *lepta*, are standard in Greek astronomical texts. Sextus Empiricus (5. 5. 8) defines the term. The zodiac, he says, is divided into twelve signs, each sign into 30 parts, and each part into 60 *lepta*, 'for that is what they call the smallest divisions'. One should therefore add 3 *lepta* each year for a total of 57/60 in a 19-year cycle. To suit his purposes, the author adds only 2 *lepta* per year. The year 5540 is the 11th of a 19-year cycle, so 22 *lepta* must be added to the epacts. The year 5540 is also the third year of a leap-year cycle, so the moon has gained 3/4 day or 45 *lepta*, prior to the insertion the next year of a lunar leap day. The sum is 67 *lepta*, which are the equivalent of slightly more than one day. The author adds this day to the already calculated 43 to yield 44. He subtracts 30, and the remainder of 14 shows that the 14th day of the moon did in fact fall on 23 March.

It is in the midst of this calculation that the text introduces for the first and only time a distinction between nature and convention. The reader is informed that the year 5540 is the tenth year of the *enneakaidekaëteris* by nature, the 11th by convention. This statement led van der Hagen, Schwartz, Serruys, and Grumel, among others, to conclude that the cycle by nature begins one year later than the cycle by convention. For Schwartz, the cycle by nature is the Byzantine cycle beginning with the Paschal moon on 2 April, while the cycle by convention is the author's name for his own cycle beginning a year earlier with the Paschal moon of 13 April. Grumel rejects that interpretation, but remains within the paradigm in stating that the cycle by nature begins one year later than the cycle by convention. In Grumel's understanding, the cycle according to nature refers to the first full 'natural' cycle of the moon beginning in the second year of creation.

These now-standard scholarly conclusions cannot be sustained. The statement that the year 5540 is the 10th by nature, 11th by convention, is not consistent with the context and must be an error. For the previous three years, the author makes calculations for each of the years when the Lord observed the Passover with his disciples. Of the year 5537, he says (399. 5) that it was the 8th year of the *enneakaidekaëteris* according to nature, and the 21st year of the 28-year solar cycle according to nature. The year 5538 (404. 15) was the 9th year of the *enneakaidekaëteris* according to nature, and the 22nd year of the 28-year solar cycle according to nature. The year 5539, he says (406. 16–407. 1), was the 10th year of the *enneakaidekaëteris* according to nature, and the 23nd year of the 28-year solar cycle according to nature. At the beginning of his long discussion of the year 5540, the year of the Passion, the chronicler follows the same sequence, stating (408. 20–409. 2) that Christ went to the Passion in the 19th year of Tiberius, which began on 21 March during the 4th indictional year, the 11th year of the *enneakaidekaëteris* according to nature, the 24th year of the 28-year cycle. Therefore a few pages later, when the author subtracts one from the cosmic year, divides 5539 by 19 and finds a reminder of 10, if he is going to make a distinction, he should state that it is the 10th year of the *enneakaidekaëteris* by convention, the 11th by nature.

Beaucamp et al. (1979: 277–82) have argued that a copyist was surprised to find the statement after the division by 19 that it was the '10th year of the *enneakaidekaëteris*'. He therefore qualified it by stating that it was the 10th 'by nature', and added that it was the 11th 'by convention'. This explanation may be correct, but it is incomplete. The copyist should have reversed the qualification, stating that it was the 10th 'by convention' and the 11th 'by nature'. More importantly, the question remains unanswered why the author of the original text says that the year was the 10th of the *enneakaidekaëteris* and thus surprised the copyist. Some parallels in other passages suggest an answer to that question.

The year 5541

At the next year in his narrative, the author discusses the date of the first Passover that the disciples observed in the year after the Passion, the cosmic year 5541. At the beginning of the passage (423.5–6), he says that it was the 12th year of the *enneakaidekaëteris*, the 25th of the 28-year cycle. He does not use the phrase 'according to nature' here. The numbers 12 and 25 follow correctly the sequence established for the years 5537 through 5540 for the cycles according to nature. Without making a calculation, the author states (425. 1–10) that 'in accordance with the previous method' the 14th day of the moon fell on Friday, the 11th day of April, and the disciples observed the anniversary of the Resurrection on 13 April. The 'previous method' is a reference to the calculation of fractional epacts for the year of the Passion.

The same method is required to bring the 14th day of the moon in the following year to 11 April, instead of 12 April as in the usual tables.

There follows a lengthy digression on the rules that the church has established for the observance of Easter on the first Sunday after the first full moon after the vernal equinox, with deferment to the following Sunday if the 14th day of the moon falls on a Sunday. He then returns to the date of the first Easter and makes a calculation (429. 13–21). He divides 5540 by 19 and finds a remainder of 11. He then says that the 11th year of the *enneakaidekaëteris* according to nature has 1 epact. Since the year in question is the cosmic year 5541, the chronicler has followed the procedure of subtracting 1 from the cosmic year before making the calculation. He then adds to the epact the 13 days before the luminaries, the 7 prelunar days, 11 days from 21 March to 31 March, and 12 days of April for a total of 44. There is a remainder of 14 after the subtraction of 30, so it follows that the 14th day of the moon was on 12 April. He then calculates the day of the week to find that 12 April was a Saturday.

The surprise here is not so much that the author now calculates that the 14th day of the moon was on 12 April, whereas a few pages earlier he had stated that it was 11 April, but that he characterizes the year as the '11th of the *enneakaidekaëteris* according to nature', although he said previously that it was the '12th of the *enneakaidekaëteris* of the moon'. This statement seems to reinforce the conclusion of Schwartz and Grumel that the cycle according to nature runs one year behind the cycle according to convention. Again, however, it follows from the author's explicit characterization of the years 5537, 5538, and 5539, as the 8th, 9th, and 10th of the *enneakaidekaëteris* 'according to nature' that the year 5541 must be the 12th in that sequence. The insertion of the phrase 'according to nature' at 429. 16 is an error, whether on the part of the author or a later copyist.

The year 5506

There is another example in the discussion for the year 5506. Here, the chronicler wants to calculate the age of the moon for the first day of September. The month of September is important, he says (369. 5–370. 15), citing the Book of Leviticus, because it corresponds to the seventh month of the Hebrew year, which begins on the first day of the moon with the Feast of Trumpets, followed on the 10th day by the Day of Atonement, and from the 15th to the 22nd day of the moon the Feast of Tabernacles.

The author's interest in these festivals for the year 5506 derives from his efforts to date the conception of John the Baptist, for which 23 September is the traditional date in the calendar of the Greek church. According to the

Gospel of Luke (1: 36), the Annunciation to Mary occurred in the sixth month after the conception of John. Once 25 March had been established as the date of the Annunciation to Mary, it followed that John must have been conceived in September or October. Luke says (1. 8–10) that Zacharias, John's father, was a priest serving at the temple at the time of a great gathering of the people. When he had completed his service and was departing for home, the angel Gabriel informed him that his wife Elizabeth would conceive and bear a son. The author of the *Chronicon Paschale* argues that a great gathering at this time of the year can refer only to the festivals of the seventh Hebrew month, and that Zacharias would not have departed until after the conclusion of the seven-day Feast of Tabernacles—that is, not before the 23rd day of the month. The tradition associating the priestly service of Zacharias with the Feast of Tabernacles is first attested by John Chrysostom in a sermon preached for Christmas of the year 386 (*PG* 49. 356–8).

We want to know, the chronicler says (368. 8–11), what day of the moon and what day of the week it was on the 1st day of September in the year 5506 from the creation of the cosmos. 'Subtract 1 from 5506 and divide 5505 by 19. Nineteen times 200 is 3800. Nineteen times 80 is 1520. Nineteen times 9 is 171. The remainder is 14. The 14th year of the *enneakaidekaëteris* has 4 epacts.' The author then proceeds to add to the 4 epacts, 13 days before the luminaries, 11 days from 21 March to the end of the month, and 154 days from 1 April to 1 September, for a total of 182. The remainder after subtracting multiples of 30 is 2. Therefore the 1st day of September in the year 5006 of the cosmos has the second day of the moon.

Here the author has omitted the 7 prelunar days. He also simply equates September with Tishri, the seventh month of the Hebrew year, instead of calculating 1 Tishri as a function of 1 Nisan. By thus distorting the calendrical facts, the author achieves the result that he wants, dating the annunciation to Zacharias on 23 September.

The year in question is the year 5506 of the cosmos. According to the definitions given in the prologue, this must be the year 5506 of the cycle according to nature that began on 21 March in the year 1. To find the epact, it is necessary first to subtract 1 from the cosmic year and divide the result by 19. The remainder is 14. The author says it is therefore the 14th year of the *enneakaidekaëteris*, without qualifying that phrase by adding 'according to nature'. For the year 5507, however, calculating the moon for 25 March, the day of the Annunciation to Mary, the author says (375. 13–14) that the year is the 16th of the *enneakaidekaëteris* and that it has 15 epacts 'written upon it'. Again, he does not add the phrase 'according to nature'. That it is the 16th year of the *enneakaidekaëteris* according to nature follows both from the definitions of the prologue and from the sequence established for the years 5537–40. It seems, then, that the year 5506 is the 14th of the *enneakaidekaëteris* in one sense of that term, while 5507 is the 16th year in another sense.

The year 3838

The year 3838 marks the end of the 200th 19-year cycle since creation. In that year, which began on 21 March, the author says (133. 13–19), and was the second year of the Exodus, the Lord came to Moses and Aaron and said: 'This month is the beginning of months; speak to the whole congregation of Israel and command them to take each of them a lamb on the tenth day of the month.' There follow several pages of instructions for the observance of Passover. The author then returns to the year numbered 3838 and makes calculations (139. 16–141. 3). First, he calculates the Julian date for 10 Nisan. Divide 3838 by 19, he says. Nineteen times 200 is 3800, nineteen times 1 is 19. There is a remainder of 19. The 19th year according to nature has 30 epacts. Add 13 days before the luminaries, 7 prelunar days, 11 days after the 21st of March, and 9 days of April, for a total of 70. Take away twice 30, which is 60. The remainder is 10. Therefore the 10th day of the first month was 9 April.

The author interrupts his calculations here to answer the reader's question of why he did not first subtract 1 from the 3838 and calculate from the number 3737. The reason, he says, is that it was during the year 3838 that the Lord came to Moses and Aaron, and the year 3839 began on 21 March. He then calculates the 14th day of the month. Take the 30 epacts of the 19th year by nature and add 13 days before the luminaries, 7 prelunar days, 11 days from 21 March, and 13 of April. The total is 74. Take away twice 30, the remainder is 14. Thus the 14th day of the moon in the present year was 13 April. The calculation of the day of the week follows. 3838 plus 1/4 of 3838 yields 4797. Divide by 7. The remainder is 2. Add 3 days before the luminaries, 11 days from 21 March, 13 days of April, for a total of 29. Divide by 7. The remainder is 1. So 13 April was the first day of the week.

The author correctly states that the year 3838 is the 19th according to nature (139. 19). He repeats this fact a few lines later (140. 11) using the adverbial dative 'by nature'. What is surprising is his statement that the 19th year has 30 epacts. Although his discussion of the *enneakaidekaëteris* has been lost from the preface, we can infer by analogy with what he says about the 28-year solar cycle that the *enneakaidekaëteris* according to nature began with 0 epacts in the year of creation and would have had 30 epacts in the first year of each succeeding *enneakaidekaëteris*. The 19th year should therefore have 18 epacts.

The author is making calculations for the year 3839, which is the first year of a cycle and should therefore have 30 epacts. He is looking at the year 3839 from the perspective of Moses and Aaron when they received the commandment. He has in effect subtracted one before dividing by 19 and finding a remainder of 19. The year 3838 is the 19th of an *enneakaidekaëteris* according to nature. The year 3839 is the first of an *enneakaidekaëteris* according to nature, but it is the 19th in the calculated sequence of epacts that begins with 1×11 in the second year of a cycle and ends with 19×11 in the first year of a cycle, which yields an epact of $209 - 180 = 29$. The intervention of the *saltus* at that point raises the epact to 30.The year for the calculation is 3839. The number for the calculation is 3838. That number divided by 19 has a remainder of 19, with an epact of 30. To say that this remainder is 'the 19th year by nature' is confusing and not consistent with the author's terminology elsewhere. Again, the adverbial dative suggests the possibility of scribal interpolation.

The year 5537

It is for the year 5537, the year of the first Passover that Jesus observed with his disciples, that the author makes his only complete calculation of the lunar epact (395. 14–22). We want to know, he says, on what day of the month the 14th day of the moon is in this the year 5537, which began from 21 March. Divide 5536 by 19. Nineteen times 200 is 3800. Nineteen times 90 is 1710. Nineteen times 1 is 19. The remainder is 7. Multiply by 11, total 77. Take away twice 30. The remainder is 17. To these 17 epacts for the year, add 13 days before the luminaries, 7 prelunar days, and 7 more counted from 21 March to 27 March to reach the desired total of 44. Take away 30. The remainder is 14. Therefore the 14th day of the moon is on 27 March.

In all other instances, after subtracting 1 and finding the remainder of division by 19, the author states the epact for that year. Here he calculates the epact by multiplying the remainder by 11 and subtracting the lesser multiple of 30.

At the conclusion of the discussion for the year 5537, the author states (399. 5–9) that this year of the Lord's first Passover with his disciples was the 8th year of the *enneakaidekaëteris* according to nature of the moon and the 21st of the 28-year cycle according to nature of the sun.

The year 5537 when divided by 19 yields a remainder of 8, so it is the eighth year of the *enneakaidekaëteris* as counted from the year of creation as 1. In order to find the epact, one must first subtract 1 from the cosmic year, divide by 19, and find the remainder of 7. The author does not say here that the year is '7 of the nineteen'. The procedure is, however, analogous to the calculations for the years 3838, 5506, and 5540, where the author expresses the remainder of the division as year *n* of the *enneakaidekaëteris*, where *n* is 1 less than the number of the year within an *enneakaidekaëteris* numbered from the creation.

vii. The *Enneakaidekaëteris* according to Calculation

The oscillation in the numbering of a year within a 19-year sequence led Schwartz and Grumel to believe that the chronicler had two different cycles before him. For Schwartz, the one cycle was based on the chronicler's own cosmic era, the other on the Byzantine era. For Grumel, the two are the cycles 'according to nature' and 'according to convention' that Grumel finds rooted in the reform of the Anatolian cycle that he wrongly supposes took place in Constantinople in the 340s or early 350s.

Beaucamp et al. (1979: 279–83) rightly argue that the author of the *Chronicon Paschale* used only one cycle—the cycle according to nature beginning with a lunar epact of $0 = 30$ and increasing by eleven epacts each year, ending in the 19th year with epact 18. They believe that the chronicler sometimes calculated the epact, sometimes looked it up in a table. Calculation, they point out, is the author's usual method for finding the solar epact. On two occasions, however (405. 11, 407. 3), he simply states the epact as a function of the place of the year within the 28-year solar cycle.

These commentators collected eleven instances where they believe the author had recourse to a table to look up the lunar epact. These eleven cases are actually only ten, since they have treated the discrepancy between 10 and 11 in the year of the Passion as two instances. Of these eleven, they say that in seven instances the author has used a table based on the cycle according to nature, in which the first year corresponds to the year 1 of the cosmos with 0 epacts. One divides the cosmic year by 19. The remainder gives the number of the year within the cycle. The computist then looks at a table to find the epacts for that year.

In the remaining four instances, according to Beaucamp and her colleagues, the computist has first subtracted 1 from the number of the cosmic year before looking up the epact in a table. They believe that this was a table based on the Byzantine cycle and that these four cases represent the work of a later interpolator. They claim that these four instances apply to dates in which later Byzantine chronography was particularly interested—the first observance of the Passover by Moses in the desert, the Annunciation to Zacharias, the Passion, and the first Easter observance by the disciples in the year after the ascension. Although they reject the distinction between cycles according to nature and convention, Beaucamp et al. nevertheless agree with their predecessors that the text reflects the use of two different 19-year cycles.

Such hypotheses of contamination are unnecessary. Nor is it necessary to suppose that the author sometimes calculated the epact, sometimes looked it up in a table. The text is fully intelligible on the hypothesis that whenever the author numbers a year within the *enneakaidekaëteris* as a function of the cosmic year reduced by 1, he does so because he is calculating the lunar epact. When he numbers the year as the remainder of the cosmic year divided by 19, without the subtraction of 1, he already knows the epact for the year as a result of other calculations and has no need to look it up in a table.

The year of the Exodus (139. 16–140. 5) is an exceptional case, widely separated from the other calculations. For the year 3839, the year of the first Passover in the desert, the author divides by 3838 by 19 to find a remainder of 19. A remainder of 19 is the equivalent of a remainder of 0. The author knows therefore, without recourse either to a table or to a detailed calculation, that he is dealing with the first year of a cycle, having epact $30 = 0$.

The author's next lunar calculation (368. 5–11) is for the year 5506, the year of the conception of John the Baptist. He subtracts 1, divides 5505 by 19, finds a remainder of 14, and states that the 14th year of the *enneakaidekaëteris* has 4 epacts. Here he is calculating the epact, although he does not show the arithmetic. Fourteen times eleven is 154, which is divisible by 30 with a remainder of four.

For the year 5507, the author wants to know the moon for 25 March, the date of the Annunciation. Here (375. 13–14) he does not subtract 1, but states that 5507 is the 16th year of the *enneakaidekaëteris* with 15 epacts 'written upon it'. This phrase suggests the existence of a table, in which the reader could find the epact of 15. The author himself need not have used such a table, except perhaps the one inscribed within his head. Having stated the epact for the year 5506 as 4, he knows that the epact for 5507 will advance by 11 to yield 15, even without performing a calculation or consulting the list of epacts that he no doubt had memorized.

The calculations for the baptism of Jesus and the dates of the Passovers that he observed with his disciples follow the same pattern as the years 5506 and 5507. For the year 5537 he offers (395. 14–19) a full calculation of the epact. He subtracts 1, finds a remainder after division by 19 of 7. Multiplying 7 by 11 and subtracting 60, he finds that the epact is 17. For the years 5538 and 5539, no calculation is necessary. The epact for 5538 is $17 + 11 = 28$ (405. 1–4) and for 5539 the epact is $28 + 11 = 9$ (406. 13–19). Thus the author can simply state that the year 5538 is the 9th of the *enneakaidekaëteris* according to nature and the year 5539 is the 10th. Similarly, for the year 5540, he could simply advance the epact again by 11. It is now the 11th year of the *enneakaidekaëteris* according to nature and so will have epact $9 + 11 = 20$. Since it is the year of the Passion, however, and he wants to employ fractional epacts to show that the 14th day of the moon was actually on the 23rd of March and not, as a table would show, on the 24th, the author calculates the year as 10 out of 19, with 20 epacts

(414. 10–415. 2). As for the year 5506, he does not show the arithmetic. The full calculation would multiply 10 by 11 to produce 110, subtract the lesser multiple of 30, to yield the epact for year as $110 - 90 = 20$.

The author uses the term '19-year thing' in two different senses. First, there is the 19-year cycle according to nature, which begins from 21 March in the first year of the cosmos. The cosmic year n when divided by 19 yields as a remainder the number x of the year within the cycle according to nature. Second, there is what we may call the '19-year thing' according to calculation. The number $n - 1$ when divided by 19 yields as a remainder the number $x - 1$ out of 19 for the purposes of calculating the epact. The author is not careful to distinguish between these two senses linguistically, and sometimes he confuses the reader by designating both numerations as 'natural'.

In the critical passage at 414. 15–17 for the year 5540, the statement that 5539 divided by 19 leaves a remainder of 10 and makes it the year 10 out of 19 is consistent with calculations elsewhere. Beaucamp et al. may be right that it was a confused copyist who added the word 'by nature' and the phrase '11th by convention'. In any case, this problematic passage cannot support the conclusion that the cycle according to nature began one year later than the author elsewhere defines it.

The author's failure to distinguish linguistically between two different methods of locating a year within an *enneakaidekaëteris* does not negate the fact that he is fully consistent mathematically in his methods of calculation.

viii. The Chronicler's Achievement

The author of the *Chronicon Paschale* sought to reform the Alexandrian cycle in two ways. First, he wanted to adapt the cycle to the Roman calendar. This objective he accomplished simply by moving the seat of the epact from the last day of the Alexandrian year to 31 December, the last day of the Roman civil year. Thus, instead of beginning with epact $30 = 0$ on the last epagomenal day and a new moon with epact 1 on the first day of Thoth, the reformed cycle began with epact $30 = 0$ on 31 December and a new moon on 1 January. This transposition brought the Paschal full moon of 13 April to the head of the cycle, as had been the case with the cycle of Hippolytus and the Roman 84-year cycle in its classical form. In the Alexandrian cycle, 13 April appears at the third year. Moving the head of the cycle to this position therefore required the computist to make an adjustment to the cosmic era of Annianus, either reducing it by two years to the year corresponding to 5491/0 BC or raising it by seventeen years to 5510/9. The choice of the latter conveniently produced a date for the creation of the sun and the moon on Wednesday, 21 March.

As Schwartz and Grumel suggested, the chronicler also wanted to restore the traditional date of the Passion on Friday, 23 March, in the year corresponding to AD 31, as had been established in the chronography of Julius Africanus (see Ch. 17). He would thus displace the historically impossible date of Annianus on 23 March in the cosmic year 5533, corresponding to AD 42. With the year 1 according to nature counted from 21 March of 5509 BC, the date of the Passion corresponded to the cosmic year 5540.

The chronicler retained the Alexandrian position of the *saltus* at the end of the cycle, so that the sequence of epacts was the same as in the Alexandrian cycle. This is the cycle represented in the fourth Paschal wheel. It had the result of restoring in the 18th and 19th year the dates of 6 April and 26 March for the Paschal full moon that had appeared in the original cycle of Anatolius in the 9th and 10th years. It was perhaps for this very reason that the chronicler's work failed to win general acceptance in its original form. The decree of Justinian to which the Armenian tradition attests had definitively established 5 April and 25 March as the dates for the Paschal full moon in those years of the cycle (see Ch. 12).

5. THE EMERGENCE OF THE BYZANTINE ERA

Grumel was right to characterize the cosmic era of the *Chronicon Paschale* as the 'Proto-Byzantine era', a necessary precondition for the Byzantine era, rather than a later corruption of it. He was wrong in his understanding of the process that led from the one to the other.

Grumel (1958: 115–116, 124–8) argued that the Byzantine era arose as a correction to the age of the moon at the time of its creation. The cosmic era of the *Chronicon Paschale* produced a date for the creation of the moon on Wednesday, 21 March, the conventional date of the vernal equinox. With a date for the Paschal full moon of 13 April, however, that cycle implied an age of the moon at the time of its creation of 21 days—a waning third-quarter crescent, rather than a full moon. The solution was to move the date of creation forward by one year, from 18 March of the year corresponding to 5509 BC to 31 March of the following year. With a calculated 14th day of the moon on 2 April in that year of the cycle, the moon would have been truly full in its 15th day when created on Wednesday, 3 April 5508 BC. As evidence, Grumel points to the passage in the work of George the monk and presbyter where he justifies a cycle beginning with epact 11 on the grounds that the solar cycle was inaugurated on the Sunday of creation, so that it was in the fourth day of its course when created on

Wednesday. The moon was created full and therefore in its 15th day—hence a differential of 11 between the solar and lunar epacts. Grumel also cites some dating formulae expressed in the Byzantine era that he interprets as implying a new year some time in the spring and argues that this was the original form of the Byzantine era. In the next step of the process, the beginning of the year was moved back to the previous September to coincide with the civil year. In Grumel's view, the coincidence between the Byzantine era and the indictional cycle is no more than that—a coincidence.

Grumel's reconstruction is unnecessarily complex. His examples for a Byzantine era beginning in March 5508 BC are not convincing. He claims that Theophanes in his comparisons of years numbered according to the Alexandrians and according to the Romans must have used a Roman (Byzantine) era beginning in March of 5508. Yet Theophanes makes that comparison only three times (3. 8, 136. 18, 412. 22), and in each case there is simply the differential of 16 years. If the cosmic year of Theophanes began in March, that is because he follows Syncellus and Annianus in dating the Sunday of creation to 25 March, not because he knew a Byzantine era beginning 31 March. In other cases that Grumel cites, the numbers lead to a year 1 in 5507 BC.

Grumel's prime example (1958: 125) is a document from the synod of Trnovo convened by Tsar Boril of Bulgaria and dated to 11 February, Indiction 14, in the cosmic year 6718 (Synodicon of the Tsar Boril). A cosmic year 6718 reckoned from 1 September 5509 BC corresponds to AD 1209/10, but Indiction 14 to AD 1210/11. If 11 February 6718 corresponds to AD 1211, then the year 1 must have begun in March of 5508 BC. However, a 13th-century text in Old Bulgarian can hardly serve as a witness to the origins of the Byzantine era.

Medieval Russian chroniclers adopted the Byzantine era at a time when the Russian calendar year began on 1 March.[9] Some texts number the year from an epoch corresponding to March of 5508 BC, others from March of 5509 BC. Russian chronologists refer to the epoch of 5508 as 'the March year' and the epoch of 5509 as 'the ultra-March year'. Ultra-March is the older system.[10] The old Russian system of dating represents the adaptation of the Byzantine era to the local calendar—not adoption of the Byzantine era with an epoch originally in March of 5508 BC.

Numerals are notoriously liable to mathematical error and textual corruption. The Madaba inscription is a good example. It reads 'February 6074, 5th Indiction'. The archaeological context requires a date in the seventh or eighth

[9] I owe the reference to Leofranc Holford-Strevens.

[10] The fundamental study is Berezhkov 1963: 9–12; brief discussions in English can be found in Dietze 1971: 41–3 and Dimnik 1981: x f.

century. Leah Di Segni has therefore proposed amending the date to 6274, 5th Indiction, which would correspond to February of 767 with a Byzantine era that began in March of 5508 BC. That proposal assumes an error on the part of the stone-cutter in omitting the second digit. That person could also have made a mistake in the fourth digit or in the number of the indictional year. Even if Di Segni's proposal is correct, the inscription only serves to show, like the Slavic evidence, that there were local variations in the calendar date that counted as the beginning of a new cosmic year—not that March of 5508 was the original form of the Byzantine era.

I can find no direct evidence in Byzantine texts that the creation was ever dated to 31 March of 5508 BC. George does not calculate a date for creation on Sunday, 31 March. He only states in general, theoretical terms why a cycle could begin with epact 11. Matthew Blastares (Letter Pi, ch. 7, ll. 287–91) writing in the fourteenth century, says that the moon was created full in the fifteenth day of its course on 15 March. This is consistent with the date of the *Chronicon Paschale* for a 14th day of the moon in the year of creation on 13 April. Elsewhere, Blastares (Letter Pi, ch. 7, ll. 190–1) says that Adam was created on Friday, 23 March, consistent with the date of 21 March in the *Chronicon Paschale* for the creation of the sun. While the two claims are not fully consistent with each other, they do show that the Byzantine era beginning at a date corresponding to 1 September 5509 BC could coexist with a date for creation in a pre-calendrical year several months earlier.

Petau's intuition was essentially correct. The Byzantine era was generated precisely for the purpose of obtaining the arithmetical advantages to which George draws his readers' attention. The number of the cosmic year when divided by 4, 15, 19, or 28 will yield as a remainder the position of that year in the bissextile, indictional, lunar, or solar cycle. Instead of generating that system directly from the Alexandrian cycle, as Petau and most scholars after him have thought, the author found his model in the computistical rules of the *Chronicon Paschale*.

The cosmic era of the *Chronicon Paschale* requires the subtraction of 1 before the application of any formula. The author of the Byzantine era decided to simplify the arithmetic by moving the beginning of the year 1 forward from March to September. The natural year began at the time of the vernal equinox in March, when the world was created, but the civil year began six months later in September. The result is a new 19-year cycle that begins in the year 1 with a lunar epact of 11, if defined as of 31 December, 12 as of 1 January, with all the computistical advantages of which George the monk and presbyter boasts. This new cycle happened to coincide with the 'circle of the moon' that was carried within the Alexandrian cycle well before the time of Dionysius Exiguus.

We should not make too much of that coincidence. The odds are 18 to 1 against that coincidence, but that one chance is always possible.

i. George the Monk and Presbyter

As Serruys (1907*a*) and Grumel (1958: 116) pointed out, the earliest users of the Byzantine era retained the date of Annianus for the Incarnation in the year corresponding to AD 9. George says that the 19-year cycle now in course began in the third Indiction, the year of the world 6138, year 346 of Diocletian, the 622nd year from the Incarnation, and the 589th from the Passion. The third Indiction and the year 346 of Diocletian both correspond to AD 629/30. If that is the year 6138 of the world and the 622nd year since the Incarnation, then the Incarnation belongs to the year 5517 of the world and AD 8/9. The difference of 16 in numbering the years of the world results in an increment for the date of the Incarnation from 5501 to 5517 and for the Passion from 5534 to 5550.

George also accepted the Alexandrian dates of 5 April and 25 March for the Paschal full moon in what had been the 18th and 19th years in the cycle of the *Chronicon Paschale* and were now the 17th and 18th years in the new cycle. He explains at the beginning of the tract how one can calculate the epacts of the moon simply by multiplying the year of the cycle by 11 and finding the reminder after division by 30. A few pages later, George points out that one must add an additional day to the epact in the 17th year. He says that this is the case because the age of the moon actually advances by $11 + 1/19$ of a day each year.[11] The arithmetic does not justify the insertion of the accumulated day precisely at the 17th year. It is clear, however, that George accepts the Alexandrian dates for the Paschal moon on 5 April and 25 March, rather than 6 April and 26 March as in the fourth wheel of the *Chronicon Paschale*.

ii. The Multipliers by 5 and 6

We do not know who the 'multipliers by 5 and 6' were of whom Maximus complained only a few years after George wrote. The name derives from a method of calculating the epacts (e) of the moon as of any date in the year. One first finds the remainder (r) after dividing the number of the Byzantine year by 19. Then, instead of multiplying r by 11 to find the epact for that year, one makes separate multiplications of $(r \times 5)$ and $(r \times 6)$. The next step is to distribute the extra day of the *saltus* through the cycle by adding 5/60 of a day for each year. The resulting formula at this point is $e = 6r + 5(r + r/60)$. Then one counts the

[11] See pp. 24. 14–25. 3, 27. 27–28. 5, 29. 31–5 Diekamp.

number of days (n) from 1 January to the calendar date in question. The example Maximus gives (*PG* 19. 1261) is 17 April, which is the date of the Paschal full moon in the 19th year of an Alexandrian cycle. The corresponding year in the Byzantine cycle is 16th. Maximus counts the days as 107. For each of those 107 days, the computists add 1/60 of a day. The purpose of this addition is to add one day every two months to compensate for the fact that epacts are counted from 1 to 30, but there are only 29 ½ days in an actual lunation. The formula now is $e = 6r + 5(r + r/60) + n + n/60$. For 17 April in the 16th year the result is $e = 6 \times 1\ 6 + 5(16 + 16/60) + 107 + 107/60$. This operation yields $96 + 80 + 80/60 + 107 + 107/60$ or $283 + (187/60) = 286$. The sum of 286 is divisible by 30 with a remainder of 16. Therefore 17 April is the 16th day of the moon, according to these computists, instead of the 14th.

Grumel (1958: 117) argues that the multipliers were not the inventors of the Byzantine cycle, but sought through their method to explain why the *saltus* occurred in the 17th year. Nothing in Maximus' description suggests that this was their purpose. In fact, as Maximus points out (*PG* 19. 122), the method is based on justifying a *saltus* in the twelfth year, when the 5/60s will have accumulated to approximately one whole day.

The multipliers themselves did not generate a new 19-year cycle. They simply supplemented George's tract by applying to his cycle a formula for calculating the approximate age of the moon as of any given calendar date. The formula was probably an adaptation of one that originally had been generated for use with the Alexandrian calendar and the cycle of Anatolius, with its *saltus* in the 12th year.

iii. George Cedrenus

The Byzantine cycle of George the monk and presbyter and the Alexandrian cycle of Annianus continued to compete with one another for some time after Maximus wrote his tract. George Syncellus and his successor Theophanes still clung to the latter as the 'ecclesiastical tradition' at the beginning of the ninth century. Ultimately, it was George's cycle and his cosmic era that held sway. Byzantine Christianity had in the meantime rejected George's date of 5517 for the Incarnation and 5550 for the Passion, in favour of the date for the Passion corresponding to AD 31 and 5540 that had been asserted by the author of the *Chronicon Paschale*. In George the monk's cosmic era, that date corresponded to 5539, with a date for the Incarnation 33 years earlier in 5506. These are the dates to which George Cedrenus attests, writing about AD 1025. Cedrenus says (i. 321. 1) Christ was born in the 42nd year of Augustus, the year 5506 from the creation of the cosmos. He dates the Passion to a fourth indictional year, the year 5539 of the cosmos, adding (i. 307. 13) that it was the year 5540 'according to nature'. Cedrenus says the year 5539 began on 21 March. The year 5539 according to nature began on 21 March, but the Byzantine year 5539 began the following 1 September. The date of the Passion on 23 March was within the seventh month of the Byzantine civil year 5539, but it was the third day of the first month of the year 5540 according to nature. Cedrenus makes the correct distinction between the natural year and the civil year.

Part IV

The Origin of the Christian Era

This page intentionally left blank

14

Evidence for the Chronology of Jesus

In his letters to Petronius and to Boniface, Dionysius Exiguus takes great care to defend the Nicene orthodoxy and astronomical accuracy of his Paschal calculations. About how he came to know that the consulship of Probus is the 525th year of Christ and that the 247th year of Diocletian should be followed in the Paschal tables by the 532nd year of the Lord, Dionysius offers not a clue. Both his silence and his date have troubled scholars since the time of St Bede.

Writing about AD 725, Bede (*DTR* 47) noted that Dionysius' date for the Nativity corresponded on the 532-year cycle to 25 December AD 533. Therefore the Passion should have occurred, according to the ecclesiastical tradition of a 33-year life-span for Jesus, in the year AD 34, corresponding to 566. Accordingly, one should find in the Paschal tables at the year 566 a fourteenth day of the moon on Friday, 25 March. 'If you find what you are looking for, give thanks to God—if not, blame the chronographers.' Here Bede concedes that something has gone wrong. If the reader looks at the year 566 of the Paschal tables of Dionysius Exiguus, he will find the 14th day of the moon is marked for Sunday, 21 March.

Almost 900 years later, Joseph Scaliger (1583, book 6, pp. 541–8) expressed the wish that Dionysius should never have introduced his Christian era in the first place, especially since it was so clearly wrong. As the third millennium of that era approached, chronologists continued to puzzle over how it was that Dionysius failed, as the United States Naval Observatory put it, to 'establish an accurate date for the birth of Christ'.[1]

Not only does Dionysius' date for the first year of Christ contradict what little evidence there is in the New Testament, he also apparently disagreed with the consensus of ancient scholarship based on that evidence.

1. THE NEW TESTAMENT EVIDENCE

Only the New Testament Gospels according to Matthew and to Luke include narratives for the birth of Jesus. Mark begins with the baptism of Jesus. The

[1] http://aa.usno.navy.mil/faq/docs/millennium.php, accessed 31 Jan. 2008.

Gospel according to John proclaims Jesus as 'the Word made flesh', but offers no narrative of his birth.

With one exception, the apocryphal gospels add nothing relevant to the date. The 'Gospel of the Infancy of the Saviour', compiled originally in Syriac and preserved in Arabic, dates the nativity to 'the 309th year of the era of Alexander' (ch. 2). The same date appears in the Syriac *Chronicle of Edessa* (p. 30 Cowper), written in the sixth century. The era of Alexander refers to the Seleucid era, which began in October of the Julian year 312 BC (see Ch. 2). The year 309 would correspond therefore to 4/3 BC. As we shall see, that date agrees approximately with the calculations of Clement of Alexandria.

i. Matthew

Matthew says (2: 1–23) that when Jesus was born, during the time of Herod as King of Judaea, a star in the sky led sages from the east towards Jerusalem and thence to Bethlehem, over which the star came to rest. Learning from the wise men that a king had been born in Bethlehem, Herod ordered the slaughter of all male infants born in or near Bethlehem within the past two years. Warned by an angel, Joseph fled with Mary and the infant to Egypt. After the death of Herod, Joseph was fearful of Herod's son Archelaus and therefore returned from Egypt to Nazareth in Galilee, instead of to Judaea.

ii. Luke

Luke says nothing about the star, the journey of the wise men, or the slaughter of the innocents and the flight to Egypt. Luke does agree that Herod was king of Judaea at the time of Jesus' birth. According to this account (1: 5, 2: 1), when Herod was king of Judaea, Joseph and Mary travelled from Nazareth to Bethlehem at the time of an empire-wide census ordered by the Roman emperor Augustus. This census, Luke adds (2: 2), was the first census, conducted when 'Kurenios' was governor of Syria. A few paragraphs later, Luke says (3: 1–3) that in the 15th year of the reign of the emperor Tiberius, the word of God came to John, the son of Zacharias, and John went to the region of the river Jordan, where he preached a baptism of repentance. Among those who were baptized was Jesus (3: 21). Luke then states (3: 23) that Jesus was about 30 years old when he began his ministry.

Matthew and Luke agree that Jesus was born during the reign of Herod. Otherwise, they have different perspectives on the event. Matthew wants to explain how a native of Bethlehem came to be a resident of Nazareth. The slaughter of the innocents and the flight to Egypt provide the explanation and remind the reader of the story of Moses. Luke wants to explain how a Nazarene came to be born in Bethlehem. The census provides the explanation and links the birth of Jesus to the broader context of the empire. Ancient readers dated Jesus by reference to the 15th year of Tiberius and assumed that there was a census during the reign of Herod at the time of the Nativity. Modern commentators have generated dates for Herod independently and dated the Nativity accordingly. On the usual reconstruction, Herod died in 4 BC or shortly thereafter. Yet the first census in Judaea seems not to have occurred until AD 6.

iii. The Date of Herod

For the date of Herod, we depend on the Judaean historian Flavius Josephus, writing in the 90s. In his *Jewish Antiquities* (14. 389, 17. 191), Josephus says that Herod was declared king by the Romans during the consulship of Domitius Calvinus and Asinius Pollio (40 BC) and that he died in the 37th year thereafter (4 BC). Josephus also (17. 167) mentions an eclipse of the moon as having occurred shortly before Herod's death. Astronomical calculations permit the dating of such an eclipse to 13 March 4 BC.[2] The standard scholarly date for the death of Herod is therefore 4 BC. In the first edition of his *Handbook of Biblical Chronology*, Jack Finegan (1964: 231) accepted that date. In the second edition (1998: 299–302), he found himself persuaded by a set of recent arguments that Herod died in 1 BC, after a lunar eclipse with a calculated date of 9 January in that year.

iv. The Census

The account of Luke names 'Kurenios' as governor of Syria at the time of the census. Josephus reports (*Antiquities*, 17. 355–18. 26) that Augustus ended the independence of Judaea after the death of Herod's son Archelaus, 37 years after his victory over Antony and Cleopatra at the battle of Actium. Judaea was added to the province of Syria and Augustus sent 'Kurenios', a man of consular rank, to be the governor of Syria and to carry out an assessment of the resources of Judaea. Cassius Dio (50. 10, 51. 1) dates the battle of Actium to 2 September in the consulship of Augustus and Messala, 31 BC. The 37th year would be the year AD 6. This 'Kurenios' is certainly that Publius Sulpicius Quirinius whose name appears in the lists of consuls at Rome for the year

[2] Ideler 1825–6: ii. 391–2; see the tables of lunar eclipses in Ginzel 1906–14: ii. 541.

corresponding to 12 BC. The assessment or census that Josephus says Quirinius conducted at the time of the organization of Judaea as a province would seem to correspond well to what Luke calls 'the first census'.

A date in AD 6 is too late to accommodate a synchronism with Herod. Scholars have offered a number of arguments to try to reconcile the date of the census with the reign of Herod. One widely held theory, for example, is that the census of AD 6 was the second census when Quirinius was governor and that the census Luke mentions was the first census when Quirinius was governor or otherwise held authority in Syria.[3]

Finegan (1998: 305–6) provides a summary of the evidence and argues for a universal registration, different from a census, that he dates to 2 BC. The evidence he offers, however, is tenuous at best. Augustus states at the end of his memoirs (*Res Gestae* 35) that in the year of his 13th consulship (2 BC) the whole Roman people bestowed upon him the title of *pater patriae*. Finegan argues that the 'whole people' could not have done so without some kind of worldwide registration involving perhaps an oath of loyalty. He points out that Orosius (7. 2. 16) interprets Luke's census in this way. The idea that the title of 'father of the fatherland' required a universal oath is far-fetched. The population of Judaea were not among the *populus Romanus* at this time, anyway. In placing the first census during the reign of Herod, the author of Luke's gospel may simply have been mistaken.

v. The Star of Bethlehem

Accepting the date of 4 BC for the death of Herod, the famous seventeenth-century astronomer Johannes Kepler sought to identify the celestial phenomenon that brought the wise men to Bethlehem. Between December 1603 and October 1604, there was a triple conjunction of the planet Saturn with Jupiter, followed by the appearance of a new star (*stella nova*), which remained visible to the naked eye for the next year. Kepler (1606) published a book on the phenomenon together with an essay on the question of whether a similar set of phenomena might lie behind the story of the star of Bethlehem. A few years later (1614), Kepler devoted another book to the whole question of the date of the Nativity. He calculated that there would have been a triple conjunction of Saturn with Jupiter in June, August, and December of 7 BC, followed by a massing of Jupiter and Saturn with Mars and the appearance of a nova the next year. Kepler concluded that Jesus had been born in December of 6 BC.

[3] Münter 1827: 88–102; Mommsen 1883: 161–78; for rebuttal see Taylor 1933.

In an unpublished paper presented to a meeting of the Royal Academy of Sciences at Copenhagen in 1821, Friedrich Münter, the learned Evangelical Bishop of Zealand, reported on his discovery, in a rabbinical commentary on Daniel, of the claim that ancient Jewish astrologers expected the advent of the Messiah to be heralded by a conjunction of Jupiter with Saturn in the sign of Pisces. He called for new investigations of whether such a phenomenon might account for the star of Bethlehem. Several astronomers responded and confirmed Kepler's calculations with only minor modifications to the exact calendar dates. Münter published a short monograph on the date of the Nativity, in which he argued (1827: 104–14) on the basis of the other evidence that Jesus was born in the latter half of the year corresponding to 7 BC. He concluded that the wise men saw the conjunction of Jupiter with Saturn in May of that year (the recalculated date), interpreted it as a sign of the Messiah, and made their way towards Jerusalem. Münter also took the phenomenon as evidence that Jesus was born during the summer, as Scaliger had thought, rather than at the traditional date in late December or early January.

Meanwhile, Ludwig Ideler, who was an astronomer as well as a chronologist, carried out his own calculations. He concluded (1825–6: ii. 405–8) that there was a triple conjunction of Saturn with Jupiter on 20 May, 27 October, and 12 November of the year 7 BC. Setting aside any question of a nova, Ideler argued that the latter two conjunctions were of sufficient brightness to account for the story and that to the naked eye the phenomenon would have appeared as a single star. In a subsequent abridgment of his work (1831: 428–9 n. 3), he corrected the dates to 29 May, 30 September, and 5 December, on the basis of revised calculations.

Many other theories, with a range of dates, have been suggested to explain the star of Bethlehem.[4] In a collection of essays published in 1989 in honour of Jack Finegan on his 80th birthday, Jerry Vardaman of Mississippi State University and Nikos Kokkinos of the London Institute of Archaeology separately offered an apparition of Halley's comet in 12 BC as the source of the story.[5] Michael Molnar, an astronomer at Rutgers University, has recently (1999) argued for a gathering of Jupiter, Saturn, the sun, and the moon in the sign of Aries on 17 April of 6 BC as the phenomenon that so impressed the wise men. Consistent with his new date for the death of Herod in 1 BC, Finegan (1998: 319–20) has suggested a conjunction of Jupiter with Venus on 17 June of 2 BC as a possible candidate for the star.

The whole notion that the star of Bethlehem was a natural phenomenon subject to astronomical calculation misses the point of Matthew's narrative

[4] For a summary, see Aveni 1998.

[5] Vardaman and Yamauchi 1989: 55–82, 133–63.

and robs the star of its miraculous quality as a mobile guide much like the pillar of cloud (Exod. 40: 36–8) that led the Hebrews through the desert to Canaan. Nevertheless, the influence of Kepler has been such that 6 BC is now the most commonly accepted date for the birth of Jesus. The article 'Jesus Christ' in the 11th edition (1911) of the *Encyclopedia Britannica* was headed by the note, 'born *circa* 6 BC, Judaea'. The revised *Britannica Online* has the heading 'born c. 6–4 BC, Bethlehem'.[6]

vi. The 15th Year of Tiberius

The only statement from which an absolute date for the birth of Jesus can directly be inferred appears in Luke's account of the baptism of Jesus. Luke says (3: 1–23) that it was in the 15th year of the emperor Tiberius that the word of God came to John the son of Zacharias. Among those who presented themselves to John for baptism was Jesus. In a phrase whose exact meaning is unclear, Luke adds that Jesus was 'beginning to be about 30 years old' or that Jesus was 'about 30 years old when he was beginning'. The King James Version follows the former interpretation. The latter is the usual modern translation. The Revised Standard Version renders the phrase, 'Jesus, when he began his ministry, was about thirty years of age.'

Augustus died on 19 August, when Sextus Pompeius and Sextus Appuleius were the consuls, AD 14 (Suetonius, *Augustus* 100. 1). Tiberius permitted the Senate to proclaim him as emperor a few weeks later, perhaps at the same meeting when the Senate decreed divine honours to Augustus (Tacitus, *Annales* 1. 10). According to the *Fasti Amiternini*, that decree was dated to 17 September.[7]

The first year of Tiberius could be backdated to 19 August AD 14, to the Roman year beginning 1 January AD 14, postdated to 1 January AD 15, or synchronized with any of several civil calendars in the eastern empire that began in the fall. The Astronomical Canon (Mommsen 1898: 454) dates the first year of Tiberius to the year 338 from the death of Alexander, which corresponds to the Alexandrian year beginning 1 Thoth = 20 August, AD 14, in the mobile Egyptian calendar of 365 days used in the Astronomical Canon. Conrad Cichorius (1923) argued that Luke used the Antiochene calendar, so that the accession of Tiberius took place at the end of the year 13/14 and the second regnal year began 1 October 14. Thus the 15th year of Tiberius began 1 October 27 (cf. Holford Strevens 2005: 115).

Eusebius (*HE* 1. 10. 1) says that the 15th year of Tiberius was also the fourth year of Pontius Pilate as Procurator of Judaea. Following Josephus, Eusebius

[6] http://search.eb.com/eb/article-9106456, accessed 27 Oct. 2006.
[7] For the evidence and summaries of the scholarly debate, see Hohl 1933; Wellesley 1967.

says that Pilate served for ten years until shortly before the death of Tiberius. According to Josephus (*Antiquities* 18. 89), Pilate was deposed by the governor of Syria and sent to Rome after spending ten years in Judaea. By the time he arrived, Tiberius was dead. Tiberius died on 16 March 37 (Suetonius, *Tiberius* 73). Most scholars count the ten years from 26 to 36 (Meier 1991: 382, Finegan 1998: 362). In his *Chronicle*, Eusebius dated the appointment of Pilate to the 13th year of Tiberius according to both Jerome's (p. 173 Helm) and the Armenian version (p. 212 Karst), so that the fourth year of Pilate would have been the 16th of Tiberius; he backdated the first year of Tiberius to 1 January 14 and coordinated it with Olympiad 198.2, 14/15 (see Ch. 17). He entered the appointment of Pilate at Olympiad 201.2, corresponding to 26/7, as the account of Josephus suggests. In writing the *Ecclesiastical History*, Eusebius seems to have postdated the first year of Tiberius to 1 January 15. The fourth year of Pontius Pilate still corresponds to 29/30, but it begins within the 15th year of Tiberius.

Luke's date for the baptism of Jesus could have been as early as October of 27 and as late as December of 29. If Jesus was aged about 30 at that time, then he was born some time between 3 and 1 BC. Some scholars have argued for a date earlier than AD 27–9 as the 15th year of Tiberius, in order to bring that datum into agreement with Josephus' date for the death of Herod (see Ch. 15).

2. ANCIENT AUTHORS

Ancient authors did not have access to astronomical calculations to date either the lunar eclipse that preceded the death of Herod or any phenomenon that might have been perceived as the star of Bethlehem. Furthermore, they seem either not to have followed Josephus for the chronology of Herod or to have read Josephus in such a way as to resolve the problems. Ancient authorities dated the census, the governorship of Quirinius, and the death of Herod by reference to the birth of Jesus, rather than the other way around. Their date for the Nativity seems to have been based on Luke's approximate synchronism between the 15th year of Tiberius and the 30th year of Jesus.

i. Clement, Tertullian, Irenaeus, Origen

The earliest witness is Clement of Alexandria (*c.*180). Clement (*Stromata* 1. 21. 145–6) said that Jesus was born in the 28th year of the emperor Augustus. The Astronomical Canon synchronizes the first year of Augustus at Alexandria with the Alexandrian year corresponding to 30/29 BC. The 28th year was therefore 3/2 BC. Reckoning the interval from that date to his own time, Clement says that from the birth of Christ to the death of the emperor Commodus there are 194 years, one month, and thirteen days. Commodus died on 31 December AD 192.[8] Clement's interval leads to a date for the Nativity in November of 3 BC. Clement also says that some authorities fixed the day of Jesus' birth as the 28th day of Pachon, while others said he was born the 24th or 25th day of Pharmouthi. Those dates correspond to 25 May and 10 or 11 April, if these authorities were using the reformed (365¼-day) calendar of Alexandria (see Ch. 2).

Clement adds that the followers of Basilides celebrate the baptism of Jesus on the 15th day of Tybi, although some say it was the 11th day of that month. The 11th of Tybi corresponds to 6 January in the reformed calendar of Alexandria. Roland Bainton (1923: 102–5) has argued that if Clement's interval of 194 years, one month, and thirteen days is counted by reference to the mobile 365-day calendar of Egypt, then Clement attests to 6 January as a date for the Nativity. There are problems with the precise calculation, because of irregularities in the intercalation of leap days during this period, and because of errors in some of Clement's calculations elsewhere. Bainton may well have been right, however, that Clement was counting from a date in January. This passage is then our earliest evidence for 6 January as the date of the baptism of Jesus. On the assumption that Jesus was exactly 30 years old at the time, 6 January also became the date of the Nativity. The date is observed in the western churches as Epiphany. Eastern churches observe 6 January as the Feast of the Theophany, and for some it is a combined festival of the Nativity and the Baptism.

Tertullian and Irenaeus, who were younger contemporaries of Clement, offer the same chronology, with minor variations. Tertullian (*c.*200) stated that Jesus was born in the 41st year of Augustus, 28 years after the death of Cleopatra, adding that he suffered on 25 March, in the 15th year of Tiberius, when Rubellius Geminus and Fufius Geminus were consuls, AD 29 (*Adversus Iudaeos* 8. 11–18). Irenaeus, who was bishop of Lyons in the 190s, says (3. 21. 3) that Jesus was born in the 41st year of Augustus, without further elaboration. In a fragment of a sermon on the Gospel of Luke probably written in the 220s while he was still resident in Alexandria, Origen also dates the Nativity to the 41st year of Augustus (*Homilies on Luke*, fragment 82: 260 Rauer).

The first year of Augustus at Rome was usually counted from the year after the death of Julius Caesar, 1 January of 43 BC. His first year at Alexandria was 30/29 BC. His 28th year at Alexandria was therefore his 41st or 42nd at Rome.

The date in the 28th year of Augustus is an inference from Luke's synchronism between the 15th year of Tiberius and the 30th year of Jesus.

[8] *Historia Augusta*, Commodus 17. 1–2; Pertinax 4. 8–9.

Clement is explicit on the point: 'Fifteen years of Tiberius and fifteen of Augustus make up the thirty years leading up to the Passion.' Tertullian and Origen both say that Augustus ruled for a total of 56 years. Thus the fifteen years that Jesus lived during the reign of Augustus would begin in the 41st or 42nd year, depending on how one counted. In Alexandria, Augustus ruled for 43 years, as both Clement and Tertullian state, in agreement with the Astronomical Canon. To calculate the birth of Jesus as during the 28th year of Augustus, Clement simply subtracted 15 from 43. Strictly counted, the 15 years of Jesus' life should begin from the 29th year of Augustus.

ii. Hippolytus

In the Paschal table attributed to Hippolytus of Rome (*PG* 10. 875–88), there are some notes indicating where in a 112-year cycle the lunar data for various events in sacred history would repeat (see Ch. 7). At the second year of the table, corresponding to AD 223, is the note *genesis Christou.* At the year corresponding to AD 253 the table notes the year of the Passion. The year AD 223 recapitulates the data for the year 2 BC after two periods of 112 years, and the year AD 253 corresponds cyclically to AD 29.

Later authors also considered Hippolytus to have been the originator of the thesis that Jesus was born in the year corresponding to 5500 from the creation of Adam. Thus, Cyril of Scythopolis, author about AD 550 of seven *Lives* of Palestinian monks, says that St Sabas died on 5 December in a tenth indictional year, in the year 6024 of the cosmos, the 524th year from the Incarnation, according to the system of Hippolytus and of Epiphanius of Cyprus.[9] A tenth indictional year corresponds to AD 531/2. Cyril follows the absolute date for the Incarnation in the Alexandrian year AD 8/9, established by Annianus of Alexandria, but he has adjusted the cosmic year from the 25 March of Annianus to synchronize it instead with the Indictional year (see Chs. 10 and 16). Thus the year 524 of the Incarnation began 1 September 531 for Cyril, instead of 25 March 532 as in the system of Annianus. It is to Hippolytus, however, not Annianus, that Cyril attributes the idea that the Christ was born in the middle of the sixth millennium. Hippolytus is also among those whom the early ninth-century Byzantine chronicler George Syncellus congratulates (381. 24) for having dated the Incarnation to the year 5500. Epiphanius did not use a system of enumerating years from the Incarnation. He uses years counted from the creation of the cosmos only in summarizing the generations of the patriarchs (*Panarion* 55. 5, ii. 332–3 Holl).

[9] *Vita Sabae* 77, p. 183 Schwartz; cf. *Vita Euthymii* 40, p. 60 Schwartz.

One source of these claims is the commentary on the Book of Daniel attributed to Hippolytus. Scholars believe the work was written in the first decade of the third century (Ogg 1962: 4). The author states (3. 23–4) that 'the first appearance of our Lord in the flesh took place in Bethlehem, in the 42nd year of Augustus, in the year five thousand and five hundred from Adam'. The text goes on to explain that the dimensions of the Ark of the Covenant, totalling 5½ cubits, are symbolic of these 5500 years.

Among the works listed in the inscription that preserves the Paschal table of Hippolytus is a chronicle. This work survives, albeit in a redacted form, in the anonymous Latin text known as the *Liber Generationis* (Mommsen 1892: 89–140). This text (130–1) gives an interval of 30 years from the birth of Christ to the Passion, and an interval of 206 years from the Passion to the present year, which is the thirteenth of the emperor Alexander Severus and the year 5738 from Adam. Alexander become sole emperor in March of 222.[10] The thirteenth year of Alexander would have been AD 234. From these intervals it follows that Hippolytus dated the Nativity to the year 5502 of the cosmos, corresponding to 3 BC.

Marcel Richard (1950) has argued that Hippolytus gave expression in his *Commentary on Daniel* to the general idea that Christ appeared in the middle of the sixth millennium, but when he came to compose his *Chronicle* some years later, his chronology required a date for the Nativity in 5502. George Ogg (1962: 6–7) offers a similar argument, apparently unaware of Richard's article. Ogg also (1962: 11–18) effectively refutes the suggestion of some scholars that Hippolytus abandoned the date corresponding to 2 BC and by moving the year of the Nativity from 5500 in the *Commentary on Daniel* to 5502 in the *Chronicle* anticipated the Christian era of Dionysius Exiguus.

The whole question is complicated by the debate over whether all three of these works belong to the same author (see Ch. 7). Osvalda Andrei (2006) has recently argued that the Paschal table, the commentary on Daniel, and the chronicle are all the work of the 'eastern Hippolytus', a different person from the author of the *Refutation of All Heresies*. She suggests that in the *Chronicle* Hippolytus was responding to the *Chronographiae* of Julius Africanus and in the process gave greater precision to his dates for sacred history than in his earlier works.

iii. Julius Africanus

Like Hippolytus, Julius Africanus believed that Christ had come into the world in the middle of the sixth millennium. His *Chronicle* has not survived.

[10] *Historia Augusta*, Severus Alexander 7. 1–2.

Substantial fragments are extant, especially in the works of Eusebius of Caesarea and in the chronicle of George Syncellus.

Syncellus quotes Africanus as having stated (381. 24) that 'the Jews in their histories have handed down the number of 5500 years until the appearance of the saving Word in the time of the Caesars'. Syncellus also names Africanus, alongside Hippolytus, as one of the authorities who dated the birth of Christ to the cosmic year 5500.

Syncellus (251. 24–9) cites Africanus for having counted an interval of 903 years from the establishment of the annual archonship at Athens to the archonship of Philinus, the 250th Olympiad, the consulship of Seleucus and Gratus, the third year of the emperor Elagabalus, and the year 5723 of the cosmos. The names of Seleucus and Gratus appear in the Roman consular lists at the year corresponding to 221, and it was during that year that the 250th Olympiad was observed.

On the basis of the apparent synchronism between the year 5723 and AD 221, Denis Petau (1630, *PG* 19. 1404) concluded that the year 5500 corresponded to 3 BC and that Africanus dated the birth of Christ either to that year or to the year 5501, corresponding to 2 BC. More recent scholars have come to similar conclusions. The standard study of Africanus and his influence remains that of Heinrich Gelzer, published in three instalments between 1880 and 1898. According to Gelzer (1898: i. 46–50), Africanus synchronized the year 5500 with the Roman year corresponding to 2 BC. He dated the Incarnation to March of that year and the Nativity either to 25 December of 2 BC, or following the Alexandrian tradition to 6 January of 1 BC. Thus Africanus agreed with what Gelzer characterizes as the consensus of all ancient authorities.

V. Grumel (1958: 22–4) has argued that Africanus dated the Sunday of creation to 22 March of the year corresponding to 5501 BC and that the year 5501 would have counted as the year 1 of his Christian era, corresponding to 1 BC. More recently, Finegan (1998: 154–7) has reviewed the evidence and concluded that Africanus dated the Nativity to the year 5500, corresponding to the second year of the 194th Olympiad and to 3/2 BC.

As these variations among modern scholarly conclusions show, the evidence for the chronographic system of Julius Africanus as a whole and for the date of the Nativity in particular is problematic. Africanus may well have been the ultimate source for the now common era promulgated by Dionysius Exiguus. Chapters 16, 17, and 18 explore that possibility.

iv. Eusebius of Caesarea

In the time of Dionysius Exiguus the standard source for chronological information was the *Chronicle* of Eusebius, either in its Greek original or through the translation and extension done by St Jerome in the 380s. Eusebius dated the death of Herod to the year corresponding to AD 4 (p. 170 Helm). Eusebius counted Herod's 37 years from the death of Hyrcanus, the last of the legitimate Hasmonean rulers. Josephus says (*Antiquities* 15. 174–5) that Herod murdered Hyrcanus shortly after the Battle of Actium (31 BC).

Eusebius agreed with earlier authorities in dating the Nativity to the year corresponding to 2 or 3 BC. In the *Chronicle* (p. 169 Helm), Eusebius enters the birth of Jesus at the third year of the 194th Olympiad and the 42nd year of the emperor Augustus, 2/1 BC. At the same year Eusebius notes that 'by a decree of the Senate, Quirinius was sent to Judaea to conduct a census of the people and their possessions'.

In the *Ecclesiastical History*, Eusebius explicitly states (1. 5. 2) that Jesus was born in the 42nd year of the rule of Augustus, and the 28th year after his defeat of Antony and Cleopatra. At the end of the seventh book, Eusebius says (7. 32–8. 2) that the great persecution began in March of the 19th year of Diocletian, and 305 years after the Nativity. March of the 19th year of Diocletian was AD 303. If that was the 306th year from the birth of Christ, then Jesus was born about 3 BC.

v. Epiphanius of Salamis

Epiphanius of Salamis dated the Nativity to the 42nd year of Augustus, specifying the consuls as Augustus XIII and Silvanus—the correct names for the year 2 BC (*Panarion* 51. 22; ii. 284 Holl, ii. 50 Williams). Epiphanius also attests to a tradition that dated the Nativity to the consulship of Sulpicius Camerinus and Betteos (*sic* for Vettius?) Pompeianus (51. 29; ii. 300 Holl, ii. 60 Williams). The consulship of Camerinus and Gaius Pompeius, AD 9, was the date later established by Annianus of Alexandria. The text of Epiphanius is corrupt in this passage, and I shall discuss it in connection with the chronology of Annianus in Ch. 16.

vi. Later Latin Authors

Sulpicius Severus (*Chronicle* 2. 27) said that Jesus was born in the 33rd year of Herod the Great and was crucified in the 18th year of Herod the Tetrarch, in the consulship of Fufius Geminus and Rubellius Geminus. From that date Severus counted an interval of 372 years to his own time and the consulship of Stilicho, AD 400. Sulpicius says that Herod the Great ruled for a total of 37 years and was succeeded by Archelaus for 9 years, and then Herod II for 24 years. Since he synchronized Herod II's 18th year with the consulship of the two Gemini, AD 29, it would follow that the 33rd year of Herod I, when

Jesus was born, was the year corresponding to 3 BC. Sulpicius Severus names the consuls for the year of the Nativity, however, as Calvisius Sabinus and Passienus Rufus, whose year corresponds to 4 BC.

Prosper of Aquitania published an epitome and continuation of the Chronicle of Jerome shortly after the year 455. He stated (Mommsen 1892: 407–8), according to most of the manuscript witnesses, that it was in the 44th year of Augustus that Quirinius was sent to Judaea to conduct a census and that in the same year Jesus Christ was born in Bethlehem. Other manuscripts attest to a variant reading of the 42nd or 43rd year of Augustus. In the manuscripts of Jerome's chronicle (p. 169 Helm), the corresponding notices fill the space at the 42nd and 43 years of Augustus. The 44th year of Augustus corresponds to AD 1. We do not know what number Prosper originally wrote, and this notice cannot serve as independent evidence of a date for the Nativity in the year AD 1.

Orosius was a native of the Spanish peninsula, who was acquainted with both St Augustine and St Jerome. To Augustine he dedicated a history of the world in seven books from Adam to the year 5618. He followed Eusebius and Jerome in counting 3184 years from Adam to the birth of Abraham and 2015 years from Abraham to the birth of Christ in the 42nd year of Augustus.[11] For the historical period, he numbered the years from the foundation of Rome, which he dated (2. 4. 1) to the sixth Olympiad (756–753 BC), in the 414th year from the fall of Troy. He dated the Nativity (6. 22. 5) to the year 752. Elsewhere (6. 21), Orosius equates the year 726 with the consulship of Augustus VI and Agrippa II. That consular year corresponds to 28 BC, so that the year 752, when Christ was born, corresponds to 2 BC. The year 1 of the city in this system was 753 BC, the traditional date.

Shortly before Dionysius Exiguus published his Paschal calculations, his friend Cassiodorus composed a chronicle dedicated to King Theodoric. This work consists of a list of early kings drawn from the *Chronicle* of Jerome, followed by a list of consuls ending with the consulship of Theodoric's son Eutharic, AD 519. Cassiodorus adds historical notes drawn from a number of sources. At the consulship of Lentulus and Messala, 3 BC, Cassiodorus notes the birth of Christ in the 41st year of Augustus (Mommsen 1894: 135).

3. CONSULAR LISTS AND THE *CHRONOGRAPH OF 354*

Some of the texts that preserve the Roman consular list have historical notes. Those that include a note on the Nativity generally agree with Epiphanius that

[11] Orosius 1. 1; Jerome pp. 10, 15, 169 Helm.

Christ was born during the consulship of Augustus XIII and Silvanus, corresponding to 2 BC. The *Fasti Vindobonenses* and the list preserved in the text known as the *Excerpta Barbari* note the birth of Christ in the consulship of 'Augustus and Silvanus' (Mommsen 1892: 278). The *Consularia Constantinopolitana* differs only in the nomenclature, noting the Nativity under the consulship of 'Octavian XIII and Silanus' (Mommsen 1892: 218).

The *Chronograph of 354*, however, which includes the oldest and best of the consular lists, notes the Nativity at the consulship of Caesar and Paullus, AD 1 (Mommsen 1892: 56). In Mommsen's edition, the list is numbered from 245 to 753 AUC, then from 1 to 354 after Christ, so that the entry for the birth of Christ actually appears at the year marked AD 1. The numbers are Mommsen's—there for the reader's convenience, but not already in the manuscript. The ninth-century exemplar from which all extant copies were made was lost some time in the seventeenth century. Mommsen's edition includes a description of that manuscript written by Nicholas Fabri de Peiresc in 1620. Peiresc cites an example from the consular list, and it is clear from his description that the list was not numbered.[12]

The list exhibits only five chronological notes. At the consulship of Marcellus and Cruscellus (AUC 705 = 49 BC) stands the note *hoc usque dictatores fuerunt*—literally, 'up to this time there were dictators', meaning there were no more dictators after Julius Caesar. Caesar was named dictator in 49 BC for the purpose of holding elections, and the office was bestowed upon him again several times before his death in 44.[13] The other four notes are all Christian. At the year of Caesar and Paullus, which is AUC 754 and AD 1, we read *Hoc cons. dominus Iesus Christus natus est VIII Kal. Jan. d. Ven. luna XV* ('in this consulship, the Lord Jesus Christ was born, 25 December, Friday, 15th of the moon'). At the year 782, which is AD 29, the year of the two Gemini, is the note, *His consulibus dominus Iesus Christus passus est die Ven. luna XIIII* ('When these were consuls, the Lord Jesus Christ suffered, Friday, 14th of the moon'). At the year corresponding to AD 33, we learn that Peter and Paul came to Rome and at the year corresponding to 55 that they suffered and died.

The notice for the martyrdom of Peter and Paul in the consulship of Nero and Vetus, AD 55, is clearly a mistake. Other versions of the consular lists are similarly mistaken. One notes the martyrdom of Peter and Paul under the consulship of Nero II and Piso (AD 57) and another at the year of Nero III and Messala (AD 58).[14] Tradition associated the martyrdom of Peter and Paul with Nero's persecution of Christians, which Tacitus (*Annales* 15. 44) links with the

[12] Mommsen 1892: 19–29; Declercq 2002: 225.
[13] Cassius Dio 41. 35, 42. 20, 43. 14, 44. 8.
[14] Mommsen 1892: 220, 283.

great fire of the year 64. Eusebius in the *Ecclesiastical History* (3. 24–6) reports the death of Peter and Paul between events that he dates to the 8th and 12th years of Nero (AD 62 and 66), while in the *Chronicle* (p. 185 Helm) he notes their martyrdom at the 211th Olympiad (AD 65–8). How an erroneous date found its way into several versions of the consular lists we do not know.

Elsewhere in the *Chronograph of 354* is a list of annual observances in the Roman church, beginning (Mommsen 1892: 71) with *VIII Kal. Ian. natus Christus in Betleem Iudeae* ('25 December, Christ was born in Bethlehem of Judaea').

This entry and the note at the consulship of Caesar and Paullus constitute our earliest evidence for the adoption of 25 December (the eighth day before the Kalends of January) for the celebration of the Nativity in the Roman church. The date of 25 December in Hippolytus' *Commentary on Daniel* (4. 23) is a later interpolation (Ogg 1962: 9). The earliest evidence for 25 December in the Greek church is Gregory of Nyssa's sermon in memory of his brother Basil. Basil died on 1 January, probably in AD 379 (Barnes 1997). Gregory notes that the anniversary of Basil's death is several days after the celebration of Christmas.[15]

C. W. Jones noted (1943: 70, 381) that the date for the Nativity in the *Chronograph of 354* corresponds to AD 1. He therefore suggested that Dionysius' Christian era was not an invention of his own, but 'historical'—historical at least in the sense that there was precedent for it at Rome almost 200 years earlier.

Georges Declercq (2002: 225–6) rejected Jones's suggestion on the grounds that the *Chronograph of 354* was preserved in a single manuscript and was apparently little known in the time of Dionysius. Jones never claimed, however, that Dionysius found his date in the *Chronograph of 354*. He remarked only that the two dates are the same. The relevant question is not whether Dionysius knew and used the *Chronograph of 354*, but whether there already existed within the traditions of the Roman church by the middle of the fourth century a date for the birth of Jesus corresponding to the consulship of Gaius Caesar and Aemilius Paullus, AD 1.

According to the notice, Jesus was born on 25 December, a Friday and the 15th day of the moon. We can check that information against the list's own internal data, which include the day of the week and the age of the moon for 1 January of every year. The consular list gives the age of the moon as 24 on Sunday, 1 January of the next year, so that 25 December of the consulship of Caesar and Paullus, would have been Sunday, the 17th day of the moon, not Friday, the 15th of the moon. Within a ten-year interval in either direction,

[15] *In Basilium Fratrem*, section 1.

only in the years corresponding to 6 BC and AD 6 would 25 December have been a Friday; and only in the years 10 BC and AD 10 would 25 December have been the fifteenth day of the moon.

One version of the *Fasti Vindobonenses* agrees with the *Chronograph of 354* that Jesus was born on the 15th day of the moon, but gives the weekday as Sunday. Another does not state the weekday, but gives the moon as 14. Both versions have the entry at the year corresponding to 2 BC (Mommsen 1892: 278).

Since it disagrees with other versions of the Roman consular list and lacks internal consistency, the notice of the *Chronograph of 354* cannot serve as independent testimony for the existence of a Roman tradition dating the Nativity to the year corresponding to AD 1.

4. THE *MARTYRIUM OF ST PAUL*

The *Martyrium of St Paul* dates the Nativity at an interval of 462 years before the 174th year of Diocletian. The interval from the birth of Christ to the first year of Diocletian would therefore be 289 years. The text is attributed to Euthalius, an author of uncertain date and provenance whose editorial comments on the text of the Pauline epistles are found in a number of manuscripts of the New Testament (Robinson 1895: 29–47).

Dionysius counted the year 248 from Diocletian as being equivalent to the year 532 from Christ. The first year of Diocletian is therefore the year 285 from Christ. Eusebius says at the end of the seventh book of the *Ecclesiastical History* (7. 32. 30) that he has recounted a story of 305 years from the birth of Christ to the Great Persecution. In the eighth book (8. 2. 2) he states that the persecution began in the 19th year of Diocletian. If the year 305 or 306 from Christ is the 19th year of Diocletian, then the first year of Diocletian would have been the year 287 or 288 from Christ.

The *Martyrium of St Paul* includes two chronological notes dating the martyrdom of St Paul with respect both to the birth of Jesus and to the present time. The first note reads, 'he was martyred at Rome, on the 5th day of the month of Panemos, the third day before the Kalends of July in the Roman calendar, in the 36th year from the Passion and the 69th year from the appearance of our Saviour Jesus Christ. The entire time from his martyrdom is 330 years to the present consulship, which is the fourth of Arcadius and the third of Honorius, 9th year of the 15-year cycle of the Indiction, 29 June' (Robinson 1895: 29). The consulship of Arcadius IV and Honorius III was AD 396, which was a 9th indictional year.

In some manuscripts, there follows an additional note (Robinson 1895: 47), the work of a later scribe, extending the count to his own time. 'And from the fourth consulship of Arcadius and the third of Honorius to the present consulship, which is the first consulship of Leo Augustus, twelfth of the Indiction, 5th day of the month of Epiphi, year 174 of Diocletian, there are 63 years, so that the whole time from the appearance of the Saviour is 462 years' (my translation). If the year 174 of Diocletian is the year 462 from Christ, then the first year of Diocletian was the year 289 from Christ.

In the second note, the month is Epiphi, the 11th month of the Egyptian calendar. In the first note, the Macedonian month of Panemos has been named, as if it were the equivalent of Epiphi. The 5th of Epiphi is equivalent to 29 June in the post-Augustan reformed (Julian) calendar of Egypt. During the period of Ptolemaic rule, the Macedonian calendar was eventually assimilated to the Egyptian calendar such that the Macedonian months were simply different names for the Egyptian months. In that system, however, Panemos was assimilated to Tybi in one version, to Pachon in another, but not to Epiphi.[16] The equation of Panemos with Epiphi suggests a system in which the Macedonian month of Gorpiaios was assimilated to Thoth, as was the case at Gaza, according to the Florentine *hemerologium*.[17]

The intervals of 36 and 69 years from the Passion and the Nativity to the martyrdom of Paul agree with the Euthalian prologue to the epistles of Paul, where the author cites the *Chronicle* of Eusebius as authority (Robinson 1895: 29). The date 5 Panemos = 29 June also comes from the prologue, where the author notes that this was the date of the Roman commemoration of the martyrdom of Paul. From the *depositio martyrum* attached to the *Chronograph of 354* (Mommsen 1892: 71) we learn that 29 June in the consulship of Tuscus and Bassus (AD 258) was the date when the relics of Peter and Paul were deposited at their respective resting places. The equation of 29 June with 5 Panemos suggests a Palestinian origin for this note.

The *Martyrium* computes an interval of 330 years from the death of Paul to the year corresponding to 396. The total is 399 years, and the date implied for the birth of Jesus is 4 BC. The difference of two years with respect to the Eusebian date results from incorrect calculation of the interval between the death of Paul and the present consulship. Eusebius dated the death of Paul to the year corresponding to AD 68, so that the correct interval to the consulship of Arcadius IV and Honorius III is 328, not 330.

16 Bickerman 1968: 38–40; Samuel 1972: 146–50.
17 Grumel 1958: 172; on this catalogue of months see Ch. 2.

The second note compounds the error. The year 174 of Diocletian (AD 457/8) is correct for the consulship of Leo I. The 9th indictional year in the earlier note is correct for the consulship of Arcadius IV and Honorius III. The 12th indictional year of the second note is consistent with it, given the interval of 63 years, but that interval is wrong. The correct interval between the two consular dates is 62 years. The interval of 462 years from Christ to the 174th year of Diocletian results from the addition of the incorrect intervals of 330 and 63 years to the Eusebian interval of 69 years from the Nativity to the martyrdom of Paul. The equation between Diocletian 174 and Christ 462 in this text is therefore an error. It does not attest to a date for the birth of Christ different from that of Eusebius or to an independently calculated Christian era in relation to the era of Diocletian.

5. THE LENGTH OF JESUS' MINISTRY

i. The Short Chronology

Tertullian says (*Adversus Iudaeos* 8. 16) that Jesus was crucified at the age of 30 on 25 March in the 15th year of Tiberius, the consulship of Rubellius Geminus and Fufius Geminus, AD 29. That date became the traditional date of the Passion in the Roman church. In Tertullian's formulation, the date entails a very short chronology for the ministry of Jesus, perhaps too short. If Tertullian and the later Roman tradition after him thought that both the baptism and the Passion occurred in the 15th year of Tiberius, AD 28/9, then the baptism must have taken place some weeks or months before the traditional date on 6 January. Even so, that tradition leaves insufficient time for Jesus to gain a following and become a threat to the authorities.

The more usual formulation of what scholars call 'the short chronology' assumes a public ministry of about one year. The synoptic Gospels—Mark (14: 1), followed by Matthew (26: 1) and Luke (22: 1)—explicitly mention only one visit of Jesus to Jerusalem for the Passover observance, the visit during which he was crucified. If one assumes that Jesus was baptized on 6 January, spent the traditional 40 days in the wilderness, and began his public ministry in the springtime, after the observance of Passover, then he was crucified at the time of Passover during the next year, the 16th year of Tiberius, AD 30, at the age of 31. Clement of Alexandria (*Stromata* 1. 21. 146. 3) reports that some authorities dated the Passion to the sixteenth year of Tiberius, fixing the day as either 25 Phamenoth (21 March) or 25 Pharmouthi (20 April).

ii. The Long Chronology

Eusebius established a longer chronology for the life of Jesus. In the *Chronicle* (174–5 Helm), he cites the Gospel of John, according to which Jesus was crucified on the occasion of his third visit to Jerusalem to observe the Passover (John 2: 13, 6: 4, 11: 55). The notice appears in Jerome's version at the third year of the 202nd Olympiad, AD 31/2, numbered as the 18th year of Tiberius. Jerome states in the text of the note that Jesus went to the Passion in the 18th year of Tiberius. In the Armenian version (p. 213 Karst), the notice appears in a space between the 18th and 19th year of Tiberius. The text states that it was in the 19th year of Tiberius that Jesus suffered and died. Syriac epitomes also read '19th'.[18] Syncellus too (394. 3) quotes Eusebius as having dated the Passion to the 19th year of Tiberius. In the *Ecclesiastical History*, Eusebius does not state in which year of Tiberius he thinks the Passion occurred. He does say (*HE* 1. 10. 1–2) that Jesus began his ministry in the 15th year of Tiberius at the age of about 30 and that the whole period of his ministry was less than four full years. It seems unlikely therefore that Eusebius would have dated the Passion as late as the 19th year of Tiberius. The Syriac and Armenian translations, as well as the Greek text that Syncellus knew, derive from a redaction of the *Chronicle* of Eusebius in which an original '18th' year of Tiberius was changed to '19th' (see Ch. 16).

If Eusebius meant to date the Passion to the 18th year of Tiberius, counted from his accession in August of AD 14, then the date corresponded to the spring of AD 32. In Jerome's version of the *Chronicle* the notice stands at the third year of the 202nd Olympiad, AD 31/2. In the text of the notice, however, Eusebius cites Phlegon's record of a solar eclipse in the fourth year of the 202nd Olympiad as evidence for the darkness that fell upon the earth at the time of the Passion. The evidence does not permit a firm conclusion about Eusebius' date for the Passion.

The claim that Jesus lived to about the age of 33 soon became the standard ecclesiastical teaching. Epiphanius affirmed that conclusion, as did St Bede. Epiphanius dated the Passion to the 13th day before the Kalends of April, 20 March, in the consulship of Vinicius and Longinus Cassius, the 18th year of Tiberius and the 33rd year of Jesus' life (*Panarion* 51. 23; ii. 292 Holl, ii. 54 Williams). That consular year corresponds to AD 30, which cannot possibly have been the 18th year of Tiberius. It is clear nevertheless that Epiphanius accepted the long chronology. Bede said (*DTR* 47) that Jesus was baptized at the age of 30 and preached for three and a half years.

[18] Dionysius of Tel-Mahre, at the year 2049 of Abraham.

The traditional date for the Passion in the Greek church was that established by Julius Africanus on Friday, 23 March, of the year corresponding to AD 31 (see Ch. 17). If Jesus was born in December, was baptized in January of his 30th year, and died some fifteen months later in March of AD 31, then he was born in 1 BC, or 2 BC if he is assumed to have been 31 years old at his death, instead of in his 31st year. By the long chronology, if Jesus died in his 33rd year in March of AD 31, he was born in December of 3 BC, 4 BC if he was 33 years old. Damiano Lazzarato (1952) has applied the long chronology to the traditional Roman date of the Passion on 25 March AD 29 and defended that date as historically correct. He states that Jesus was 33 years old at the time of his death and was born on 25 December 6 BC.[19] Most modern authors prefer AD 30 or 33 as the year of the crucifixion (see Ch. 3).

[19] Lazzarato 1952, as cited by Metzger 1954.

15

The Christian Era of Dionysius Exiguus

The general consensus of authorities earlier than Dionysius is that Jesus was born in the year corresponding to 2 or 3 BC. The date is an inference from Luke's synchronism of the 15th year of Tiberius with the baptism of Jesus at the age of about 30. Most scholars have thought therefore that Dionysius did not follow an established tradition, but generated his own date for the Nativity. Either he misinterpreted the evidence or he deliberately distorted it for reasons of his own. Some more recent scholars have thought that Dionysius did accept an already established date, but they have offered no satisfactory explanation of its origin.

1. THE YEAR 754 FROM THE FOUNDATION OF ROME

Modern reference-works often state that Dionysius dated the Nativity to December of the year 753 from the foundation of Rome (*ab urbe condita*) and counted the first year of the Lord from the beginning of the next Roman year in January of 754. Some authorities state that he dated from the Incarnation on 25 March of his year 1, AUC 754.

The *Encyclopedia Britannica*, in an unsigned article originally published in the 11th edition (1911), says, 'He [Dionysius] wrongly dated the birth of Christ according to the Roman system (i.e. 754 years after the founding of Rome) as Dec. 25, 753'. The statement remains unchanged in the 2006 *Britannica Online*.[1] The *Catholic Encyclopedia* (1907–12), in an article signed by John Gerard, says, 'In chronology Dionysius has left his mark conspicuously, for it was he who introduced the use of the Christian era according to which dates are reckoned from the Incarnation, which he assigned to 25 March, in the year 754 from the foundation of Rome . . .'.[2]

[1] Encyclopedia Britannica Online, http://search.eb.com/eb/article-9030542, accessed 4 July 2006.

[2] http://www.newadvent.org/cathen/05010b.htm, accessed 4 July 2006.

More recently, Friedrich Wilhelm Bautz (1990) says of Dionysius, 'He mistakenly placed the birth of Christ in the year 754 *ab urbe condita*, and specifically at 25.12 of the 1st year of his era'. Jack Finegan said in the original edition of his *Handbook of Biblical Chronology* (1964: 132), 'following a reckoning which was evidently current in his time, Dionysius placed these events [the Incarnation and Nativity] in A.U.C. 754 and for the beginning point of the era went back to Jan 1 of that year'. In the new edition (1998: 114), Finegan changed his mind about the year to which Dionysius assigned the Incarnation and Nativity, but retained the synchronism between AD 1 and AUC 754: 'For the year of the incarnation Dionysius accepted the year AUC 753 and also for the day in that year of the nativity the date of December 25 . . . Dionysius went on to the immediately ensuing first day of January (seven days after December 25), which was the commencement of the regular Roman year AUC 754 (= AD 1) to make this the beginning of the first year of his new era'.

As the variation among these opinions shows, scholars are not agreed on whether Dionysius meant to date the birth of Christ to 25 December of the year corresponding to 753 *ab urbe condita*, and that the year 1 should therefore start 1 week later on 1 January 754, or dated the Incarnation and Nativity to 25 March and 25 December of the year 754 = AD 1. If Dionysius meant to number his years from the Incarnation in the sense of Christ's conception on 25 March, then it is likely that he dated the Incarnation to AD 1. Bede (*DTR* 47) seems to have understood the year of the Incarnation in this way. Among modern scholars, Ludwig Ideler (1825–6: ii. 384) argued in favour of this view.

If Dionysius meant to number the years from the birth of Christ, rather than the conception, then it is more likely that he considered that event to have occurred on 25 December, seven days before the start of the year that we call AD 1. The consensus of most modern scholars favours that interpretation (Ginzel 1906–14: iii. 179). In fact, we do not even know that Dionysius intended his numbered years of the Lord to be counted from 1 January. They replace years of Diocletian in a table in which those years were synchronized with the indictional year. As Leofranc Holford-Strevens (2001) has pointed out, it is possible that the year 1 began on 1 September of 1 BC. The issue cannot be decided except on the basis of an answer to the question how Dionysius knew that Diocletian 247 should be followed by the year 532 of the Lord.

Given the frequency with which one encounters the claim that Dionysius Exiguus equated his year 1 with the year 754 from the foundation of Rome, one may be surprised upon actually reading his work to find that Dionysius nowhere offers this synchronism, nor indeed ever in any of his writings expresses a date reckoned from the foundation of the city. It is simply not true that numbering the years *ab urbe condita* was, as the *Encyclopedia Britannica* puts it, 'the Roman system'. Dating by consular years was the Roman system, and it is the link that Dionysius gives between AD 525 and the consulship of Probus that connects the 'Years of the Lord' to other systems of historical chronology. Only Orosius, among authors earlier than Dionysius, reports a date for the Nativity as an interval from the foundation of Rome. The singularity of that interval shows how unusual such dating was. Dionysius could not have derived his date from Orosius. Orosius (6. 22. 1) dated the birth of Christ to the year 752 from the foundation of the city.

The modern claim that Dionysius Exiguus set his year 1 as equivalent to AUC 754 derives from the practice among historians before the end of the nineteenth century of eschewing years BC and using instead Olympiad dates for ancient Greek history and years counted from the foundation of the city for Roman history. The error perhaps derives from misunderstanding of a statement by Ideler, who expressed dates in terms of numbered Olympiads or years from the foundation of Rome. Sometimes he converted the dates to Scaliger's Julian period or to years before Christ. In reference to the Christian era, Ideler concluded a lengthy argument by saying (1825–6: ii. 384), 'It seems then clearly established: Dionysius set Christ's birth at the end of the first year of his era, the 4714th year of the Julian period, the 754th of the city of Rome'.

The point of Ideler's argument here is not that Dionysius equated his year 1 with the year 754 of Rome, but that he dated the incarnation and birth of Jesus to his year 1—not, as Scaliger and other scholars maintained, to the previous year. Ideler does not mean to say that Dionysius himself dated the Nativity to the year 754 of Rome any more than that he dated that event to the year 4714 of Scaliger's Julian period.

The probable source of the error in the English-speaking world is the *Handy-Book of Rules and Tables for Verifying Dates with the Christian Era*, by John James Bond, published in four editions between 1869 and 1889. Of the Christian era Bond writes as follows:

> The first year, or 1 *Anno Christi*, called by chronologists *annus verus*, is the fourth year before 1 *Anno Domini*, hence we find that 33 *Anno Christi* corresponds to 30 A.D. This difference between the years known as *Annus Verus* and 1 *Anno Domini* was caused by Dionysius, when he introduced the present system of reckoning the Christian era, and made 1 A.D. correspond to the 46th year of the Julian era, and 754 A.U.C., instead of 750 A.U.C. = the 42nd year of the Julian era, and thus stopped four years short of the date which, according to the statement of Clement of Alexandria, had been esteemed the true date by the early Christians. (Bond 1875: 213.)

The 'Julian era' is another modern convention, referring to Caesar's reform of the calendar in 46 BC. It has an ancient precedent in Censorinus (20. 11, 21.

7), who numbers 'Julian years' from 1 January of the fourth consulship of Julius Caesar (45 BC), the effective date of the reform. Bond does not mean to say either that Clement dated the Nativity to the 42nd year of the Julian calendar, 750 AUC, or that Dionysius used the expression AUC 754 = AD 1.

2. THE 28TH YEAR OF AUGUSTUS

Even if it were true that Dionysius synchronized his year AD 1 with the year 754 from the foundation of Rome, we should know no more than that he synchronized the year 525 with the consulship of Probus and the third year of an Indiction. We should still want to know why Dionysius departed from the well-established consensus of ancient scholars according to which Christ was born two or three years earlier.

According to Clement of Alexandria (*Stromata* 1. 21. 145. 5), Jesus was born in the 28th year of the emperor Augustus. Counted from the first year of Augustus at Alexandria in 30/29 BC, the 28th year is 3/2 BC. One theory to explain the alleged 'error' of Dionysius Exiguus is that he agreed with Clement in dating the Nativity to the 28th year of Augustus, but that he counted the years of Augustus from 27 BC, when he received the title of Augustus, instead of from his first year at Alexandria.

This hypothesis seems to have originated with Bond (1872: 74; 1875: 203–4). Bond invented an 'era of Augustus' dating from 27 BC and argued that Dionysius counted the 28th year of Augustus from that era. Werner Keller also popularized the theory, although without reference to Bond, in his *Bible as History: A Confirmation of the Book of Books*, first published in 1955 under the title *Und die Bibel hat doch recht* (p. 353 in the English translation of 1956). John Mosley refuted the idea in an article on 'Christmas Errors' published in 1981. According to Mosely, every schoolboy knew the story of the battle of Actium, 'and a prominent historian working in Rome would not have made such a simple blunder'. Nevertheless, E. G. Richards (1998: 218) has recently reiterated this view:

> Dennis had assumed from a reading of Clement of Alexandria that Christ was born in the twenty-eighth year of the reign of the Emperor Augustus. He assumed that Augustus' reign began in 727 AUC—but there he was mistaken. What he did not realize was that the reign of Augustus was always calculated from his decisive victory over his rivals for power, Anthony and Cleopatra . . . at the battle of Actium fought on 3 [*sic*!] September 723 AUC, rather than his acceptance from the Roman people of the title of emperor on 13 January 727 AUC.

We do not know that Dionysius had read Clement's *Miscellanies*. If he did, he would have found in that work, not only the statement that Jesus was born in the 28th year of Augustus, but also that Augustus ruled at Alexandria for a total of 43 years and that he defeated Antony at Actium in the year of his fourth consulship. Clement also reckons intervals from the first Olympiad to the battle of Actium and the fourth consulship of Augustus: 24 years to the foundation of Rome, thence 243 years to the expulsion of the kings, thence 186 years to the death of Alexander, and from there to the victory of Augustus 294 (*Stromata* 1. 21. 139, 144–5).

The fourth consulship of Augustus was 30 BC, which is the correct date for the beginning of his first year at Alexandria, but not for the battle of Actium itself. Cassius Dio (50.10, 51.1) dates the battle to 2 September of the consular year corresponding to 31 BC. Clement's interval of $243 + 186 + 294 = 723$ from the foundation of Rome to the fourth consulship of Augustus yields AUC 724 for the first year of Augustus. Nothing in Clement's text would lead Dionysius or anyone else to conclude that the first year of Augustus should be synchronized with AUC 727.

In the first book of his *History of the Church* (1. 5. 2), Eusebius says that Jesus was born in the 42nd year of the rule of Augustus, and the 28th year after his defeat of Antony and Cleopatra. This is consistent with his equation in the *Chronicle* (p. 163 Helm) between the last year of Cleopatra and the 15th year of Augustus.

Whether from Clement or from Eusebius, Dionysius would have known to count the 28 years either from the battle of Actium or from the first year of Augustus at Alexandria, rather than from his proclamation as Augustus three or four years later. Furthermore, while 27 BC is the modern, scholarly date for the beginning of Augustus' principate at Rome, ancient authorities rarely used that date. Suetonius (*Augustus* 8. 2) says that Augustus held power alone for 44 years after the defeat of Antony. Cassius Dio (56. 30. 5) says Augustus died on 19 August, having ruled alone for 44 years, less 13 days, from his victory at Actium. Eutropius (7. 8) says that Augustus returned to Rome after the defeat of Antony and Cleopatra, twelve years after his first consulship, and from that time ruled alone for 44 years, his principate being 56 years in total. The only exception is Censorinus, who refers (21. 8) to 'the years of the Augusti' as beginning from the consulship of Caesar VII (i.e. Augustus) and Agrippa III (27 BC), when Augustus received that title. He also (22. 16) refers to the consulship of Marcius Censorinus and Asinius Gallus (8 BC), when the month Sextilis was renamed August, as the 20th year of Augustus. These Augustan years refer literally to the years since the conferral of that name and do not correspond to the years that the man so named held power in Rome.

Dionysius would have been quite alone in counting the regnal years of Augustus from 27 BC.

3. THE 15TH YEAR OF TIBERIUS

Another approach finds the source of Dionysius' error in his reckoning of the fifteen years of Tiberius. This hypothesis originated with James Ussher (1658, at the cosmic year 4015 = AD 12) as a way to reconcile Luke's statement that Jesus was about thirty years old in the 15th year of Tiberius, AD 28/9, with the date for the death of Herod in 4 BC.

Clement of Alexandria (*Stromata* 1. 21. 145) said that Jesus was born in the 28th year of Augustus, that Augustus ruled for 43 years and that the 30 years from the Nativity to the Passion consist of fifteen years of Tiberius and fifteen of Augustus. In the view of Ussher, Clement—and all other early Christian authors after him—erred in counting the 15th year of Tiberius from his accession shortly after the death of Augustus in AD 14, instead of from AD 12, or even earlier, when Augustus made Tiberius his colleague in the exercise of the imperial power. If the first year of Tiberius was AD 12, his 15th year was AD 26, and Jesus was born 30 years earlier in 4 or 5 BC, and therefore within the reign of Herod. Pagi (1689: xiv) and Münter (1827: 3) offered similar arguments.

Philip Mauro (1922: 84–5) applied a variant of this view to Dionysius Exiguus, so as to account for his four-year error. Unfortunately, Mauro himself committed a combination of arithmetical with typographical error:

> Dionysius Exiguus calculated that the year of our Lord's birth was A.U.C. 753. He made his equivalence of dates from Lu 3:1, 'Now in the fifteenth year of the reign of Tiberius Caesar' etc., at which time Christ was 30 years of age according to Lu 3:23. But it was ascertained later that a mistake of four years had been made; for it clearly appears by Mt 2:1 that Christ was born before the death of Herod, who died in 749 A.U.C. Tiberius succeeded Augustus, Aug. 19, A.U.C. 767. Hence his 15th year would be A.U.C. 779 [*sic*!]; and from those facts Dionysius was right in his calculation. But it was discovered in later years that Tiberius began to reign as colleague with Augustus four years before the latter died. Hence the 15th year mentioned by Luke was four years earlier than was supposed by Dionysius and consequently the birth of Christ was that many years earlier than the date selected by Exiguus, which date has been followed ever since.

Suetonius and Velleius Paterculus say that the Roman Senate, at the request of Augustus, conferred upon Tiberius equal power in the management of the provinces and the armies. Velleius Paterculus (2. 121) reports the matter after the disastrous defeat of Quinctilius Varus in Germany and before the campaign into Germany of Tiberius and Germanicus. Suetonius (*Tiberius* 20–1) says the senate passed such a decree two years after that campaign. Cassius Dio (56. 25) dates the campaign to the consulship of Marcus Aemilius and Statilius Taurus, AD 11. Thus Suetonius supports Ussher's date in AD 12, and Velleius Paterculus supports Mauro's date in AD 10.

As Ludwig Ideler pointed out (1825–6: ii. 418), such a reckoning of the reign of Tiberius is a strictly modern conjecture for which there is no literary or numismatic precedent in antiquity. In fact, if one were to count the years of Tiberius differently than from the death of Augustus, the most legitimate terminus would be his assumption of the tribunician power. Imperial coinage often bears a legend with a numbered year of the emperor's tribunician power (Mattingly 1930). Suetonius (*Tiberius* 9. 10, 11. 3) says that Tiberius received a grant of the tribunician power about the time of his second consulship (7 BC) and before his retirement to Rhodes. Coinage shows Tiberius in the 12th year of his tribunician power as early as AD 10 (Barnes 1974: 24).

Manipulation of the regnal years of Tiberius cannot produce a credible explanation for the choice of the year we call AD 1 as the first year of Christ.

4. THE GREAT PASCHAL PERIOD

One of the most widely held views among scholars is that Dionysius calculated his date for the year 1 with the assistance of the Paschal period of 532 years.

i. Joseph Scaliger

Scaliger took notice of the remarkable coincidence that Dionysius numbered the first year in his Paschal table as the year 532. The number 532 is the interval of the great Paschal period—the period after which the phases of the moon will return to the same day in the year and the same day of the week in the Julian calendar. It derives, as Bede explained (*DTR* 65), from multiplying the 19 years of the lunar cycle by the 4 years of the leap-year cycle and the 7 days of the weekday cycle. On Scaliger's hypothesis (1583, book 2: 157–63), Dionysius thought that the Incarnation and Nativity should have occurred in the first year of a 532-year period. Accordingly, Dionysius numbered as 1 the first full year of Christ's life on earth in the second year of a cycle.

Scaliger's theory rests partly on the mistaken assumption that Dionysius followed the example of Victorius of Aquitania and composed a Paschal table covering a full cycle of 532 years. St Bede (*DTR* 65) extended the 95-year table of Dionysius through an entire Paschal period of 532 years, beginning with the year 532 and ending with the year 1063. When Joannes Noviomagus (Johannes von Bronckhorst) first published these tables in 1537 he attributed to Bede the composition of eighty-four 19-year cycles (three 532-year periods), encompassing 1596 years from the birth of Christ to 1595 (*PL* 90. 826). Misled by Noviomagus and apparently misunderstanding Bede, Scaliger wrongly supposed that Dionysius had drafted tables to the year 1063 and that Bede had extended them to 1595. Indeed, some of the manuscripts of Dionysius' tables carry the heading, 'Here begins the book of Dionysius Exiguus on the great Paschal cycle of 532 years' (Krusch 1938: 63). Denis Petau, in book 2 of his work (1703: i. 116), agreed with Scaliger that Dionysius had composed a 532-year table. By the time he wrote book 12 (1703: ii. 222) Petau had relized the mistake and insisted that Dionysius wrote but one 95-year cycle. Antoine Pagi (1689: vi) tried to revive the theory, arguing that the 532-year table began with the year of the Incarnation and was something separate from the 95-year table that began in 532. Johann Wilhelm Jan in his *Historia Cycli Dionysii*, published in connection with his 1718 edition of Dionysius Exiguus, finally put to rest the notion of a 532-year Dionysian period (*PL* 67. 473–7.)

The idea that Dionysius had composed a 532-year table actually predates Scaliger by some 700 years in a commentary on Bede's *Reckoning of Time*. It is preserved as a set of marginal notes in some of the manuscripts. The commentator states that there are 'now from the Incarnation 873 years'. In the preface to his edition of the text, C. W. Jones (1977: 257–61) suggested the writer might have been Martin the Irishman working at the *scriptorium* in the cathedral of Laon.

Bede had said that Dionysius, 'placing the 532nd year of our Lord's Incarnation at the beginning of his first cycle, plainly taught that the second year of his cycle was the same as that when the mystery of the same most holy Incarnation began'.[3] Bede apparently thought that Dionysius knew of the 532-year period, but he did not attribute to him the composition of a 532-year Paschal list. The commentator misunderstood:

He [Dionysius] composed 28 circuits of 19 years in his great cycle. And in the first of those circuits, immediately after the first year, he placed the year of the incarnation of the Lord—that is the year that corresponds in all conjunctions of the sun and the moon to the year in which the Lord was incarnate. He did not begin from the very year in which he was incarnate, because it was not the first year of a 19-year cycle. For the

[3] *DTR* 47, translation of Wallis 1999: 126.

cycle runs through 28 years and therefore it was necessary that he should begin from the first year of a 19-year cycle.

ii. Gustav Oppert

Gustav Oppert (1900: 116–17) recognized that Dionysius did not compose a table of 532 years, but nevertheless argued that he knew of the great Paschal period and used it in fixing the era of the Incarnation. On Oppert's theory, Dionysius knew that Jesus had been born a little more than 500 years before his own time. He also accepted the Alexandrian tradition that Jesus rose from the dead on Sunday, 25 March. So he looked at his 95-year extension of the Alexandrian tables to find the first year when appropriate data for the Resurrection would recur—a year when Easter would fall on a Sunday, 25 March, shortly after the 14th day of the moon. He found those data at what would correspond to the year 279 of Diocletian. Dionysius accepted the shorter chronology for the career of Jesus and assumed that he would have been 31 years old at the time of his death. Applying the 532-year period, Dionysius decided that the year corresponding to Diocletian 279 should be numbered as $31 + 532 = 563$. He accordingly numbered the first year of his table, corresponding to Diocletian 248, as the year of the Lord 532. Oppert's argument has been widely accepted.[4]

Georges Declercq (2002: 213–24) has discussed Oppert's hypothesis in detail and argued that Dionysius neither used the great Paschal period for any computistical purpose nor recognized it as a true cycle. He acknowledges that Dionysius knew the work of Victorius of Aquitania and his claim that the data for Easter would repeat after 532 years. But since Dionysius regarded Victorius' calculations as fundamentally flawed, he probably also rejected the claim of a 532-year period. In the prefatory letter to Petronius, Dionysius points out (Krusch 1938: 64) that a cycle of 95 years does not constitute a true period. Had Dionysius accepted the 532-year period of Victorius, Declercq says, he would certainly have mentioned it in this context.

Declercq also argued, quite rightly, that Dionysius, working in the sixth century, would not have followed the short chronology for Jesus' public ministry. Prosper of Aquitania (Mommsen 1892: 409) affirmed the validity of the long chronology some 70 years before Dionysius published his tables. In his chronicle written shortly before Dionysius Exiguus published the Paschal tables, Cassiodorus accepted the year corresponding to AD 31 as the date of the Passion, but he dated the Nativity 33 years earlier to 3 BC (Mommsen 1894: 135–7).

[4] Ginzel 1906–14: iii. 179; Rühl 1897: 198; Krusch 1938: 60.

5. THE GOLDEN NUMBER

The Alexandrian cycle had a base-date corresponding to the first year of Diocletian. The numbered year of Diocletian when divided by 19 therefore yields as a remainder the number of the year in the cycle—the so-called 'Golden Number' (see Ch. 6). Marius Chaîne (1925: 64–6) argued that Dionysius wanted the difference between his new Christian era and the era of Diocletian to be a multiple of 19, so as to preserve this computational tool. The difference between 532 and 248 is 284, not 285. Chaîne accounted for the discrepancy by appealing to the difference between the Alexandrian year beginning 29 August and the Roman year beginning 1 January. 'The years of the era of Diocletian give us the same Golden Number as the years of the Dionysian Christian era, taking account of the difference due to the change in the starting-point of the epacts.'

The arithmetic will not support the hypothesis. Dionysius should have made his table begin with 533 if he wanted to maintain the same correspondence with respect to the Golden Number.

6. EUSEBIUS AS POSSIBLE SOURCE

For anyone working in Rome in the early sixth century, the obvious place to look for a date for the birth of Jesus or for an interval between that date and the first year of Diocletian was Jerome's Latin translation of the *Chronicle* of Eusebius. In that work, the interval between the Nativity in the 42nd year of Augustus, at the third year of the 194th Olympiad, and the first year of Diocletian, at the second year of the 266th Olympiad, is 287 years—not, as in Dionysius' system, 284 years. Three hypotheses have nevertheless been offered explaining how Dionysius might have derived his date for the Nativity from Eusebius.

i. Gustav Teres

Gustav Teres (1984), a Norwegian astronomer, sought to rescue Dionysius' reputation for mathematical precision by arguing that he was a careful scientist who made no mistake at all. Teres asserts that 'Dionysius was neither a chronologist nor the establisher of the Christian era' and that 'it was neither his intention nor his task to determine the birth year of Christ'. In this claim

Teres is fundamentally correct. His method for showing how Dionysius obtained a date from the *Chronicle* of Eusebius is, however, seriously flawed. According to Teres, Dionysius knew that the consulship of Probus was equivalent to the year AUC 1278. He then consulted Eusebius and found that Augustus had died on 18 August 767, and that the 15th year of Tiberius therefore began in August of 782 and ended in August of 783. Dionysius simply subtracted 30 from 783 to find that Jesus was born in 753 and that the year 1 should therefore begin a week later on 1 January 754. The consulship of Probus in 1278 would correspond to the year 525 from Christ.

As Declercq (2002: 228–9) has pointed out, Teres himself makes a mathematical mistake in computing the 15th year of Tiberius. To get the 15th year one should add 14 to 767, not 15.

Teres does not state what edition of the *Chronicle* he is using. Neither Eusebius nor Jerome included a column of years numbered from the foundation of Rome. The only modern editor to supply such numbers was Angelo Mai in his 1833 edition of the *Chronicle* of Jerome, reprinted in volume 19 of the *Patrologia Graeca*. Mai noted years of Rome every 10th year beginning at Abraham 1264. The death of Augustus appears at Rome 765. In short, as Declercq notes, the data that Teres claims for the *Chronicle* of Eusebius cannot in fact be found in any version of that text.

ii. Georges Declercq

While rejecting Teres's solution, Declercq (2002: 230–46) has himself argued that it was from the *Chronicle* of Eusebius that Dionysius derived his interval from the birth of Jesus to the first year of Diocletian. Declercq says that 'the key' to this whole problem can be found in a text written by Felix, the abbot of the monastery of Gillitanus in North Africa. Victor of Tonnena says that Felix was driven into exile in 553 and died in Sinope on the Black Sea in 557 (Mommsen 1894: 203–4). The text in question is a prologue prefixed to an Easter table covering the years 627 to 721, under the heading 'preface of Felix, Abbot of Cyrillitanus'. Jones (1943: 73–4) argued that Felix wrote the preface when he introduced the 95-year table of Dionysius Exiguus to North Africa. The text (*PL* 129. 1331) can be translated as follows. The heading appears only in one manuscript (Oxford, Bodleian Library, Digby 63):

Whence Dionysius took the beginning of his computation

In the middle of Olympiad 194, the 42nd year of the emperor Octavian Augustus, our Lord Jesus Christ was born in the flesh. From the Nativity of the Lord to Olympiad 265, that is to the first year of Diocletian, there are 284 years. And from the first year of Diocletian to the first cycle of Dionysius you will find 248 years, for a total of 532 years. From here Dionysius in the year 532 from the Incarnation of the Lord began his first cycle. For the cycle of Saint Cyril ended in 247. Add 1, where Dionysius begins, and you will find 248 years.

Declercq argues that this reckoning by Olympiads must have been based on the *Chronicle* of Jerome. In that work one will find the 42nd year of Augustus noted 'in the middle' of the 194th Olympiad (Olympiad 194. 3). The first year of Diocletian, however, will be found not in Olympiad 265, but at the second year of Olympiad 266. Thus Jerome has 72 Olympiads and 288 years between the birth of Jesus and the first year of Diocletian, instead of the 71 Olympiads and 284 years that Felix claims. Declercq believes that Felix must here be repeating uncritically an explanation that he learned from someone else—namely, from Dionysius Exiguus himself. According to Declercq, Dionysius correctly calculated an interval of 287 years from the *Chronicle* of Jerome, but then 'deliberately tampered' with the data 'in order to arrive at a date that was ideal from a computistical point of view'. Having altered the interval to 284 years, Dionysius then took advantage of the lack of mathematical skill in the West at that time 'to convince those, who, like Felix, were eager to know how he arrived at the date AD 532 that it was simply based on a conversion of the Olympiads in the well known *Chronicle* of Eusebius/Jerome'.

Declercq explains the reason for the tampering. The interval of 287 years that Dionysius found in the *Chronicle* of Jerome between the 42nd year of Augustus and the first year of Diocletian suggested that the first year of Diocletian should correspond to the year 288 from Christ and that Diocletian 248 should be numbered as 535 from Christ. But Dionysius wanted that number to be divisible by 4, in order to preserve the rule, already embedded in the numbering of the years from Diocletian, that leap-years would be those years in the table whose number was divisible by 4 without a remainder. The year 536 would have been the candidate closest to the Eusebian interval between the Nativity and Diocletian, Declercq argues, but 'Dionysius must have been drawn as a magnet' to the year 532 instead. For although Dionysius did not understand the construction of the great Paschal cycle, he must certainly have noticed that 532 was the product of the 19-year lunar cycle times the seven days of a week and the four years of the intercalation. Accordingly, with the first year of his table numbered as 532, that year and every first year of a cycle thereafter would be divisible by 19 without a remainder. 'Thus', Declercq concludes, 'Dionysius was first and foremost guided by computistical and practical rather than historical considerations when he decided to synchronize the 248th year of Diocletian with the year AD 532.'

Declercq argues that Dionysius would have liked the resulting year 1 for another reason. In that year he could have computed that the Incarnation took place under the same calendrical data as the traditional Roman date for the Passion—Friday, 25 March, on the same day of the week as the creation of the first man, and on the same day as the traditional Roman date of the vernal equinox. Dionysius' remark in the letter to Petronius that the years numbered from the Lord will help remind people both of the 'commencement of our hope' and of 'the Passion of our Redeemer' shows, according to Declercq, that 'Dionysius was well aware that the date he proposed for the incarnation coincided with the traditional date for the crucifixion in the West'. Declercq thus agrees with Ideler that Dionysius numbered as 1 the year of the Incarnation and birth of Christ—not, as Scaliger, Oppert, Ginzel, and most other scholars maintain, the first full year of his life on earth beginning a week after the Nativity.

Declercq is certainly right that the data in the preface of Felix must have been drawn from the *Chronicle* of Jerome. The use of reckoning by Olympiads suggests that conclusion. The notion that Felix received this information from Dionysius Exiguus, rather than directly from Jerome, and that Dionysius deliberately deceived Felix about the origin of his 284-year interval strains credulity. We should rather regard Felix as the first of a long line of scholars to try to figure out how Dionysius chose a date in which Dionysius himself shows so little interest. Felix must have looked in the *Chronicle* of Jerome himself to try to verify the interval of 284 years. When he found the Nativity in Olympiad 194 and the first year of Diocletian in Olympiad 266, he decided to count the intervening Olympiads beginning with Olympiad 195 and ending with Olympiad 265, for a total of 71 Olympiads and 284 years.

Declercq's argument rests less on the text of Felix and data drawn from the *Chronicle* of Jerome than on computistical considerations connected with the interval of 532 years. Declercq rejects Oppert's thesis that Dionysius used the 532-period to calculate the year of the Passion, but nevertheless maintains that Dionysius must have been attracted to the number 532 like a magnet. The only substantive difference between the two hypotheses is that Oppert believes that Dionysius understood the 532-year cycle as the product of 19 and 28, while Declercq argues that Dionysius was unfamiliar with the 28-year solar cycle, but recognized 532 as the product of $19 \times 7 \times 4$.

Declercq's comment about the calendrical data for 25 March in Dionysius' year 1 is interesting, but no more persuasive than his claim that Dionysius was fascinated with the number 532. It is true that some Paschal calculators liked to find parallels among the calendrical data for the Creation, the Incarnation, and the Passion. The problem is that the data for the year 1 do not in fact anticipate the data for the Passion. In the year 1, which would have data equivalent to the year 533 in the Dionysian table, Friday, 25 March, was the 14th day of the moon. In AD 29, the traditional Roman date for the Passion, corresponding to the year 561 in Dionysius' table, the Paschal full moon would fall on 15 April. Instead of inspiring the reader to think about the Passion, a date for the Incarnation on 25 March of the year 1 would only lead the reader to discover, as Bede did to his dismay (*DTR* 47), that the data in the tables do not produce a 14th or 15th day of the moon on 25 March in the year 29, 31, 34—or any other year within an acceptable interval.

iii. Daniel McCarthy

McCarthy (2003) has claimed that Dionysius was one of several authors who received a system of numbering the years from the birth of Christ that originated with Eusebius, but not in the *Chronicle*.

From the silence of Dionysius about how he knew to synchronize Dionysius 248 with the year 532 of the Lord, McCarthy concluded (2003: 38) that he must have 'had access to a source which had already identified both the Julian year which we call AD 1, and the principle of dating events by counting the years from that epoch'. As evidence for the existence of such a system, McCarthy adduces the entry for the birth of Christ at the consulship of Caesar and Paullus in the *Chronograph of 354* and a set of entries in the Irish *Annals of Tigernach*.

In the fragments of the *Annals of Tigernach* for the period between the birth of Christ and the reign of Constantine, there is a set of notes numbering the current year from the creation of the world and from the Incarnation. These notes appear at years numbered from the Incarnation as 10, 20, 30, 63, 76, 96, 115, 134, 267, and 324. Some of the numerals are corrupt, and sometimes the position of the notice does not correspond with the numbering in the text.

McCarthy (1998; 2003: 44–6) has shown that the notes for the years 10 and 30 are interpolations and that the original series appeared at 19-year intervals beginning with the year 1 from the Incarnation and continuing through the series 1, 20, 39, 58, 77, 96, 115, 134, and so on. The numbers 267 and 324 come from a different manuscript, but belong to the same series of 19-year intervals. That the year 1 in these annals corresponded to the same year as the Dionysian AD 1 follows from the data indicating the weekday of 1 January for the various years.

The fact that these entries appeared at 19-year intervals suggests, according to McCarthy, that they were derived from a Paschal table. They cannot have been derived from the Paschal table of Dionysius Exiguus, because the series numbers as 1 what was the second year of a Dionysian cycle. McCarthy believes (2003: 46–51) that the likeliest source was an otherwise lost Paschal table of Eusebius of Caesarea. The *Annals of Tigernach* have a note at the year corresponding to AD 309 that Eusebius of Caesarea composed a 19-year cycle. Jerome (*de viris illustribus* 61) attributes such a table to Eusebius. In a letter preserved by Bede (*HE* 5. 21), Ceolfrid also attributed a Paschal list to Eusebius, although without reference to a 19-year cycle.

McCarthy argues that both the entry at the year 309 and the series of notes at 19-year intervals beginning in AD 1 came to the *Annals of Tigernach* through a now lost chronicle composed by Rufinus of Aquileia. He suggests that Rufinus used the *Chronicle* of Eusebius in its original Greek text, his own translation of the *Ecclesiastical History*, and several other sources. McCarthy believes that this work was the common source for entries in the Irish annals and in Bede's chronicle that are not included in Jerome's chronicle. McCarthy (2008) has explored that thesis further in a paper on Bede's chronological sources.

As evidence that Eusebius was interested in establishing a Christian era, McCarthy adduces the singularity of the fact that in the *Chronicle* Eusebius includes an explicit count of the years since Abraham only in the notice for the Nativity. He also takes Eusebius' interval in the *Ecclesiastical History* of 305 years counted from the birth of Christ to the outbreak of the Great Persecution as representing the use of a Christian era. McCarthy points out that the year 305 since Christ fits the series of numbers appearing at 19-year intervals in the *Annals of Tigernach* beginning with the Christian year 1.

Following Burgess (1997), McCarthy believes that Eusebius composed the *Chronicle* in its first edition between 304 and 311, then the Paschal table between 309 and 312, followed by the *Ecclesiastical History* in its first edition about 313. In the *Chronicle*, McCarthy says, Eusebius dated the Nativity to the year 2015 of Abraham and the destruction of the churches in the 19th year of Diocletian to 2320, an interval inclusively counted of 306 years, while in the *Ecclesiastical History* he dated the 19th year of Diocletian to the 305th year from the Nativity. McCarthy suggests that it was the construction of the Paschal cycle that led Eusebius to make this revision. This latter equation also appears in the *Annals of Tigernach*, where the destruction of the churches is noted at the year corresponding to AD 305.

McCarthy argues that one of Dionysius' predecessors in the transmission of the Alexandrian cycle accepted from the Paschal table of Eusebius the date for the Incarnation corresponding to AD 1. That person corrected the Eusebian equation between Diocletian 19 and AD 305 by recalibrating the tables such that the 19th year of Diocletian now corresponded to the Julian year that we call AD 303. Dionysius found a note to this effect in the prologue to the Cyrillan table.

The weaknesses in this ingenious set of arguments are manifold. We do not know that Eusebius composed a Paschal table of any kind. Jerome thought that he did, but he was mistaken (see Ch. 10). The hypothesis of a lost chronicle of Rufinus as the source for the entry in the *Annals of Tigernach* at the year 309 is plausible. But Rufinus or whoever was the source for this entry is more likely to have received the idea that Eusebius composed a Paschal table from Jerome, rather than from a copy of the *Chronicle* of Eusebius that included a notice absent from both Jerome's translation and the Armenian version.

The manuscripts that preserve this portion of the *Annals of Tigernach* date from the twelfth and fifteenth centuries. The correspondence between the year 1 of the Incarnation in this text and the Dionysian AD 1 is therefore likely to derive from the Dionysian Christian era. The fact that there is a series of entries at 19-year intervals beginning at 1, instead of 2, does not nullify this likelihood.

Furthermore, there is in fact no change in the Eusebian interval from the Nativity to the 19th year of Diocletian between the *Chronicle* and the *Ecclesiastical History*. In Jerome's version of the *Chronicle*, the two entries appear (pp. 169, 227 Helm) at Abraham 2015 and 2320, as McCarthy states. The Armenian manuscript breaks off at the 16th year of Diocletian, aligned with the year 2319 from Abraham (p. 227 Karst). The 19th year of Diocletian would therefore be Abraham 2322. Jerome's version is presumably the more reliable witness to the original Eusebian alignment of these entries. If 2015 is the year 1 of Christ, then 2320 is the year 306. In the *Ecclesiastical History*, Eusebius does not in fact equate the 19th year of Diocletian with the year 305 from Christ. What he says is that his narrative in the first seven books covers 305 years from the birth of Christ to the destruction of the churches and that he will proceed in the next book to the terrible ordeals of his own time. In the eighth book, he describes those ordeals which began, he says, with a decree issued in the month of March during the 19th year of Diocletian. The span of 305 years is therefore the period covered in the first seven books, and the eighth book begins in the next year, the 19th year of Diocletian and the year 306 from the birth of Christ.

7. V. GRUMEL

Like Oppert, Grumel (1958: 224) suggested that Dionysius followed the shorter chronology for Jesus' ministry and accepted the traditional Alexandrian date for the Resurrection on 25 March of the year corresponding to AD

31. Dionysius then subtracted the 30 or 31 years of Jesus' lifetime, choosing to designate the year that he did as number 1 because it was the first year of a Julian leap-year cycle.

Grumel's theory suffers from some of the same weaknesses as Oppert's. We do not know what date Dionysius accepted for the Resurrection, and it is unlikely that Dionysius would have followed the shorter chronology. Nevertheless, as we shall see in Ch. 17, Grumel's suggestion has merit if applied as part of the solution to the question of the Christian era of Julius Africanus.

8. SEPP ROTHWANGL

Sepp Rothwangl offered a theory of an entirely different kind in a paper presented to a conference on 'Cosmology through Time' at the Astronomical Observatory of the University of Rome in June of 2001. Rothwangl believes that Dionysius wanted to alleviate anxiety arising from the fact that the year 6000 in the chronology of Julius Africanus had already passed. He decided to postpone the second coming of Christ from the year 500 since the Incarnation to the year 2000. He observed a planetary alignment on 31 May in the year corresponding to 531. Dionysius calculated that a conjunction of all planets would occur some 1469 years later on 5 May. He identified that event with the end of an age and assigned to the year the number 2000. The year of the observed phenomenon was therefore 1469 years earlier in 531.

Rothwangl is apparently unaware that Dionysius completed his work and published his tables in the consulship of Probus, the year AD 525. Rothwangl attributes to Dionysius both an astronomical knowledge and an interest in millennialism for which there is no direct evidence.

9. CONCLUSION

In the letter to Petronius, Dionysius remarks on his decision to renumber the years with words so unobtrusive as to suggest that his date for the Incarnation was not an innovation:

> Because St Cyril began his first cycle from 153rd year of Diocletian and ended the last in the year 247, I began from the year 248 of that same man—tyrant, rather than prince. I did not wish, however, to perpetuate the memory of that impious persecutor in my cycles, so I have chosen rather to number the years from the Incarnation of our Lord Jesus Christ. (Krusch 1938: 64.)

As Leofranc Holford-Strevens has stated (1999: 778), Dionysius does not 'explain or justify the underlying date, or even claim it for his own discovery, but treats it as an unproblematic fact, corresponding to current knowledge or belief'. Although Daniel McCarthy's identification of the source of that common knowledge as Eusebius of Caesarea cannot be sustained, his intuition that Dionysius found his equation between years of Diocletian and years since Christ in his Alexandrian sources points in the right direction.

16

The Christian Era of Panodorus

1. THE COSMIC YEAR 5493

Panodorus of Alexandria was a contemporary of Annianus, both of whom flourished, according to George Syncellus (35. 6–13), in the time of the archbishop Theophilus (AD 385–412). Syncellus says (377. 27–378. 10) that Panodorus dated the birth of Christ to the cosmic year 5493, thus missing by seven years the correct date. Syncellus himself (381. 5–33) follows Annianus in dating the Incarnation to 25 March, at the end of the cosmic year 5500 and the beginning of 5501, when the Roman consuls were Sulpicius Camerinus and Gaius Pompeius. That consular year corresponds to AD 9. The year 5493 therefore corresponded to the Dionysian year AD 1.

From this evidence Denis Petau (1630; *PG* 19. 1405–6) concluded that Panodorus of Alexandria was the true progenitor of the Christian era:

> This is a striking witness for our common era, which recent chronologists think was less ancient and invented by Dionysius, and which they make an object for academic sport. That its author was at least as early as Panodorus we can conclude from George Syncellus, who says that Panodorus used the year 5493.

Antoine Pagi (1689: iv, xxxvii) expanded on this suggestion. According to Pagi, Dionysius derived his era, along with his Paschal calculations, wholly and directly from Alexandria. 'The era of Incarnation', Pagi claims at the beginning of his essay, 'was not invented by Dionysius, who rather transferred to the Latins that which the monk Panodorus had already either adopted or invented'. Returning to the point near the end of his discussion, Pagi concludes, 'Just as Dionysius did not put forward new cycles, neither did he propose a new epoch of the Incarnation: he transferred both from the East to the Latins.' Pagi thought that Panodorus himself only followed a Christian era already well established in the Greek church. There were two such eras, he suggests—the one that Eusebius used and another that Syncellus attributes to Panodorus.

Pagi cites a passage from Epiphanius as evidence that Panodorus only followed an established usage. Epiphanius is giving a date for the Persian heresiarch Manes: from the ascension of Christ to the time of Mani, Aurelian, and Probus there are 276 years, or according to others 246 (*Panarion* 66. 20; iii. 47 Holl). Probus became emperor in 276. Pagi therefore believed that the count of 276 years in this passage was reckoned from the Incarnation, with a date corresponding to AD 1, while the interval of 246 years was counted from the year of the Passion.

Mani's followers believed that he was the Paraclete (Comforter) whom Jesus had promised to his disciples (John 14: 16). Epiphanius' sources therefore counted the interval from the Ascension to the time of Manes, rather than from the Incarnation or the Resurrection. An interval of 246 years from the Ascension is approximately correct as a date for the death of Mani (Gardner and Lieu 2004: 8). It is unlikely that Epiphanius' alternative was reckoned from the Incarnation. It may have been counted from the Ascension to the time of Mani's first prophecies, rather than his death. A biographical text known as the Cologne Mani-Codex (p. 18) dates the first prophecies to the first year of the Persian king Shapur (AD 240). Perhaps the numeral should be read as 216, instead of 276.

Pagi's efforts to find precedent for Panodorus' date failed to convince. Johann Wilhelm Jan (1718; *PL* 67. 465) argued that Theophilus and Cyril would never have used the era of Diocletian for the numbering of their Paschal tables, if a Christian era had already been established. Ludwig Ideler (1825–6: ii. 388) thought that Panodorus in fact dated the Nativity a year earlier than did Dionysius. Even if the two dates do agree, he comments elsewhere (1825–6: ii. 448), it does not follow that Dionysius knew the date from Panodorus.

Schwartz (1899: 2476–7) and Oppert (1900: 109–10) noted the agreement between 5493 and AD 1, but believed the coincidence was no more than that. Grumel (1958: 90) argued that Syncellus was wrong and that Panodorus in fact dated the Incarnation to 5494. Georges Declercq (2002: 226) characterizes Panodorus as a 'shadowy' figure, whose work never reached the West and could not have influenced Dionysius Exiguus.

Panodorus is unlikely to have been the immediate source for Dionysius' equation between Diocletian 248 and AD 532. Pagi may well have been right, however, that the date of Panodorus in the cosmic year 5493 attests to a well-established tradition within eastern Christianity and that Dionysius did no more than transmit that tradition to the Latin church. The question is obscured by the paucity of our information about Panodorus, by corruptions in the text of what little information we have, and by Petau's misjudgement of his relationship to Annianus—an error that has perpetuated itself through almost four hundred years of scholarship.

2. ANNIANUS AND PANODORUS

We know of Annianus and Panodorus almost exclusively through George Syncellus. Elsewhere, the name of one 'Panodorus of Egypt' appears only in a topography of Constantinople attributed to the fifteenth-century historian George Codinus. The author (3. 34) cites this Panodorus for an explanation of how the place called Phocolisthon received its name. Panodorus had said that the emperor Phocas slipped (*olisthesai*) from his horse at that place. Since Phocas did not become emperor until 602, either the attribution of the story to Panodorus is false, or the author knew of a different Panodorus.

Outside Syncellus, only later Syriac authors mention Annianus. Elias of Nisibis, who wrote a chronicle down to the year AD 1018, cites Annianus for his chronology of the patriarchs and the rulers of the Assyrians and the Medes.[1] Mar Michael, Patriarch of Antioch from 1166 to 1199, wrote a history of the world from Adam to AD 1095. In the introduction (p. 2 Chabot) he names as one of his sources 'Enanus, monk of Alexandria, who wrote a history of the period from Adam to the emperor Constantine'. The thirteenth-century chronicler Gregor Bar-Hebraeus cites Annianus several times for Biblical chronology, probably drawing upon Michael's work.[2]

There is one possible reference in Arabic. Al-Biruni cites Ibn-Albazyar for an interval of 2226 years from Adam to the Flood, attributed to 'Athenaeus'. The name is probably a scribal error for 'Annianus'.[3]

The influence, but not the name, of Annianus is also evident in a Latin text discovered by Scaliger and known as the *Excerpta Barbari.* The text consists of a series of lists of patriarchal and royal successions, concluding with a garbled list of Roman consuls from Julius Caesar and Marcus Antonius (44 BC) to Valentinian and Eutropius (AD 387). A note for the birth of Christ appears at the consulship of Augustus and Silvanus, 2 BC, in agreement with other versions of the consular list. At the consulship of Constantius XI and Julian III, AD 360, there is a note that the years from Adam are 5854.[4] That count must have been derived from Annianus or a source dependent on him, for whom the year AD 360 corresponded to the cosmic year 5852. The numeral 5854 is an error.

Fragments of the Greek text of an illustrated chronicle closely related to the *Excerpta Barbari* were discovered among the papyri acquired from a dealer in

1 See pp. 7. 33; 8. 7–16; 15. 9–17. 4 Chabot.
2 See pp. 3, 13, 15, 16, 19, 25, 39, 40 Budge; Gelzer 1898: ii. 403–4.
3 See p. 25 with Sauchau's notes p. 374.
4 See p. 236 Schoene; Mommsen 1892: 294.

Gizeh by V. Golenishchev in 1901. Adolf Bauer and Josef Strzygowski (1905) published photographic facsimiles of the fragments with extensive commentary under the title *Eine alexandrinische Weltchronik*. This 'Alexandrian World-Chronicle' originally consisted of a chronographic and astronomical introduction followed by regnal lists beginning with the patriarchs and ending with the prefects of Egypt. The last fragment lists the prefects for the period from AD 383 to 392. The text was therefore written during or shortly after the patriarchate of Theophilus.

Bauer and Strzygowski (1905: 82–92) explored the question of whether these fragments might have come from the hand of either Annianus or Panodorus. The fragments contain nothing we know of as distinctive for either author. Bauer and Strzygowski concluded that the text emanated from the same monastic circle to which Annianus and Panodorus belonged. It testifies to the chronographic interests of those circles, but cannot be considered as a fragment of the work of either Annianus or Panodorus.

Some additions to the text of the *Chronicle* of Jerome contained in a manuscript at Leiden may derive from a similar Alexandrian world-chronicle. The manuscript is a ninth-century copy of an early sixth-century exemplar. The additions consist especially, but not exclusively, of notes relevant to Egyptian history. Alfred von Gutschmid thought the scribe had found these entries in some version of the chronicle of Panodorus.[5] He also suggested Panodorus as the source of the *Excerpta Eusebiana*—Greek excerpts from the first book of the *Chronicle* of Eusebius preserved in a manuscript at Paris.[6] The excerpts include Eusebius' list of Olympic victors, to which the author has appended some additional notes, including the statement that a wrestler from Philadelphia in the time of the emperor Theodosius the Great dented a bronze statue with his hand. Syncellus says Panodorus worked during the reign of Arcadius, so he is a good candidate for the authorship of these notes.

Syncellus mentions Annianus or Panodorus several times, but describes their work only in one passage. Syncellus has been arguing that it is inconsistent with Scripture to accept from such sources as Alexander Polyhistor, Abydenus, and Manetho the idea that the Egyptian and Chaldean kingdoms had existed for many thousands of years before the Flood. He is therefore surprised that certain authors of Christian histories should have done so. Syncellus says (16. 30–3) that he will omit their names out of respect for their memory. He proceeds to quote with commentary from the work of Manetho, Berossus, Alexander Polyhistor, Julius Africanus, and Eusebius.

[5] Schoene 1866–75: ii. xviii, citing von Gutschmid.
[6] Schoene 1866–75: i, *Corrigenda et addenda ad appendices* 242, citing 'AvG'.

Syncellus says that he will not accept the arguments of those who allegorize Berossus and Alexander Polyhistor. He quotes anonymously from one such authority. Then, apparently having forgotten his promise to suppress their names, Syncellus says (34. 24–5) that he rejects the interpretation of 'that revered monastic writer Annianus and his contemporary the monk and historian Panodorus'. A few lines later (35. 6–13) he names them again as 'those two monks Annianus and Panodorus who were contemporaries in the time of Theophilus, the 22nd archbishop of Alexandria'. He says that they wrote much that is useful, although they accepted the teachings of Alexander Polyhistor and tried to allegorize his myriads of years before the Flood.

Syncellus interrupts the general discussion to inform the reader about these two authors. He says (35. 20–31) that the work of Annianus was the more concise and the more faithful to apostolic tradition, in as much as he dated the divine Incarnation to the end of the year 5500 and the beginning of 5501. Annianus also, he says, dated both the Resurrection and the first day of creation to 25 March. Syncellus adds that these dates appear in an annotated Paschal canon (*Paschoualion*) of 532 years, in which Annianus dated the Resurrection to the beginning of the cosmic year 5534.

Syncellus cites Annianus only twice thereafter. The first citation appears on the next page (36. 21–37. 12), where Syncellus quotes Annianus for demonstrating that Eusebius was wrong in counting only 5526 years from Adam to the 20th year of Constantine. Syncellus mentions the name of Annianus again in connection with his argument for dating the Incarnation to the turn of the year 5500/1. In asserting this date, Syncellus says (381. 23–382. 4), 'I do so not on my own authority, but relying on the work of the blessed apostle and Roman archbishop Hippolytus the martyr, Annianus, that holiest of monks who composed eleven cycles of 532 years with careful notes, and Maximus, the holy monk, sage, martyr, and confessor, a great teacher of the Church.'

Of Panodorus, Syncellus says (35. 31–36. 5) that his work was manifold and variegated, useful not only for chronological theory, but also for his description of the regular motion of the sun and the moon. Syncellus criticizes him for being somewhat repetitive, for falling seven years short of the 5500 years of the Incarnation, and for dating the Passion to the year 5525 of the world instead of 5533/4. Outside this passage, Syncellus cites Panodorus six times.

(i) Panodorus agreed with Annianus in rejecting Eusebius' count of the years from Adam to Constantine, and it is not necessary to quote him on the matter (37. 12–15).

(ii) Panodorus wrongly criticized Eusebius for not accepting Manetho's myriads of years for the earlier dynasties of Egypt. Panodorus himself had a novel method for counting these years as months, claiming that before the time of Enoch and the Watchers men were ignorant of the difference between lunar and solar cycles (41. 29–42. 20).

(iii) Some ecclesiastical historians reduce Alexander Polyhistor's 30 myriads and 4,090 years (34,090) for the kings of the Chaldeans and the Medes to 94 solar years and eight months, beginning from the cosmic year 2405 and ending in 2499. Panodorus thought it was Zoroaster who first taught them to count regnal lengths in solar years, instead of solar days (88. 13–89. 6).

(iv) Africanus said that Daniel lived in the time of the Babylonian captivity, but Panodorus and other historians placed him in the time of the captivity of the Samaritans under Shalmanasar (265. 29–266. 3).

(v) The completion of the Egyptian period of 1460 years was in the cosmic year 5471 and the 15th year of Augustus, but Panodorus made it the 22nd year of Augustus. He also made another 7-year error, counting 5493 instead of 5500 (377. 27–378. 10).

(vi) Panodorus made a 7-year error, putting the Incarnation in the year 5493. His mistake derived from following the Astronomical Canon. He dated the beginning of the reign of Augustus to the cosmic year 5451, its end to 5506, and the birth of the Saviour to 5493 (396. 12–397. 10).

With the exception of the date for the prophet Daniel, these references to Panodorus concern only two issues—his theory about how to reduce the tens of thousands of years recorded in Egyptian and Babylonian sources to shorter intervals consistent with Biblical chronology; and his error in reckoning the years of Augustus and therefore also the cosmic year of the Nativity. William Adler (1989: 78–101) has dicussed the antedeluvian chronology of Panodorus. The following discussion is limited to the second of these issues. It is necessary first to establish the absolute dates of the cosmic chronology that Syncellus uses.

3. THE COSMIC CHRONOLOGY AND CHRISTIAN ERA OF ANNIANUS

Although Syncellus cites Annianus only rarely, those citations are sufficient to show that his chronological system derives from Annianus. Syncellus tells his readers (1. 1–2. 32; 376. 26–377. 1) that the whole purpose of his work is to show that the Incarnation took place at the end of the cosmic year 5500 and the beginning of the year 5501, in the 43rd year of the emperor Augustus, on the 25th day of the Roman month of March, on which calendar date both the Resurrection and the first day of creation occurred. In one passage (381. 5–382. 4), he cites the authority of Hippolytus, Annianus, and Maximus for the synchronism between the Incarnation and the year 5500/1. In another (35. 20–31), he cites Annianus alone for that synchronism and for the date of the Resurrection on Sunday, 25 March, the beginning of the year 5534, the same day that the world was made.

Three passages in particular show that Syncellus, following Annianus, dated the Resurrection to 25 March of the year corresponding to AD 42 and the first day of creation therefore to 25 March 5492 BC.

Syncellus states (381. 5–33) that the Archangel Gabriel announced to the virgin her conception of Christ on the night of 24/5 March, at the end of the year 5500. Two hundred seventy-five days later, in the 181st year of the eleventh Paschal period of 532 years, Christ was born in Bethlehem, in the 43rd year of Augustus, in the consulship of Sulpicius Camerinus and Gaius Pompeius. His use of the 532-year period here suggests that Syncellus derived the consular date from Annianus. 'Pompeius' is a corruption of the name 'Poppaeus'. The consulship of Sulpicius Camerinus and Gaius Poppaeus began on 1 January AD 9. The year 5501 therefore began 25 March AD 9, the year 5534 on 25 March AD 42, and the year 1 on 25 March 5492 BC. The 25th of March was indeed a Sunday in AD 42. Syncellus (389. 11–12) names the consuls for the year 5534 as Nero III and Valerius Messala. Nero and Messala were the consuls for the year 58. This is the same year to which some versions of the consular list erroneously date the martyrdom of Peter and Paul (Mommsen 1892: 220, 283). Somehow, as Gelzer (1898: ii. 249) suggested, Annianus or Syncellus misread the list and came to associate that consular pair with the year of the Resurrection.

Second, Syncellus (36. 21–9) cites Annianus for having dated the 20th year of Constantine to the cosmic year 5816, when the 14th day of the moon was 29 Phamenoth, 25 March, and Easter Sunday was 3 Pharmouthi, 29 March. Constantine observed his Vicennalia beginning in July of AD 325 and concluding the following year with celebrations in Rome.[7] The lunar data that Syncellus cites correspond, however, to the year AD 324 in the Alexandrian tables. If the year 5816 began on 25 March AD 324, then the year 5501 began 25 March AD 9 and the year 1 began 25 March 5492 BC.

Third, Syncellus says (2. 29–32) that he intends in his own work to cover a period of 800 years from the Incarnation to the cosmic year 6300, the first year of an Indiction. The manuscript reads 802 years, but the inclusive interval from 5501 to 6300 is 800. A first indictional year at the appropriate period was

[7] *Consularia Constantinopolitana*, Mommsen 1892: 232.

807/8. If the year 6300 began 25 March AD 808, then again the year 5501 corresponded to AD 9, and the year 1 began 25 March 5492 BC.

Syncellus, following Annianus, dated the Incarnation to 25 March, the year 5501 of the world, corresponding to AD 9. The Christian era of Annianus began with the year 1 as of that date. From the year 5501 onwards, Syncellus expresses his chronology both in cosmic years and in years numbered from the Incarnation. The first entry of this kind (384. 10–11) is labelled 'Years of the World 5505, from the divine Incarnation 5 years'.

There is a parallel to the consular dates of Syncellus in two Latin fragments—one in Milan, the other in Padua. In the Paduan fragment, the author is identified as Jerome. The author claims to have read in the works of St Victorinus of Pettau (Ptuj, Slovenia) a tradition about the life of Jesus attributed to Alexander, bishop of Jerusalem.

In his chronicle (p. 218 Helm), Eusebius dates the death of Alexander of Jerusalem about AD 250. We know of Victorinus primarily through a brief note about him in Jerome's dictionary of famous men (*de viris illustribus* 74). Chronologically, Jerome places him between Anatolius of Laodicea and Pamphilus. Victorinus therefore belongs to the latter third century.

According to the tradition represented by these fragments, Christ was born on 25 December in the consulship of Camerinus, baptized on 6 January in the consulship of Valerius Asiaticus (AD 46), and crucified on 25 March in the consulship of Nero and Messala. The Paduan fragment adds that Jesus lived for 32 years, 3 months, 11 days—a traditional lifespan for Jesus, but one that the consular dates contradict.

August Strobel (1977: 290–7) has discussed these fragments in some detail. He argues that this tradition derives from a mid-fifth century effort to harmonize the Alexandrian Easter tables with the variant traditions of the West. The attribution to Jerome, Victorinus, and Alexander is a falsification. The consulship of Camerinus as a date for the Nativity arises from the Alexandrian tradition as represented by Annianus, while the consulship of Asiaticus as a date for the baptism of Jesus belongs to the western tradition, connected perhaps with the Roman 84-year cycle. The appearance of the consulship of Nero III and Messala in the tradition represented by the two manuscripts is, Strobel says, more difficult to explain than the other consular dates, but it may be connected with the statement of Irenaeus (2. 22. 6) that Jesus lived into his forties.

It seems more likely that all three of these consular dates derive from Annianus in some version of his work that reached the west. In any case, the fragments do not attest to a date for the Incarnation in AD 9 independent of Annianus.

The consulship of Camerinus as a date for the birth of Jesus appears also in a passage of Epiphanius of Salamis, which is at least partially corrupt.[8] Epiphanius is writing against the 'Alogoi', those who deny that the Word was made flesh. Somewhere in these works, Epiphanius says, it is written that the Word of God was born in the 40th year of Augustus. Epiphanius regards that as a textual error. Then he adds, 'it also says on the 12th before the Kalends of July or June—I can't make out which—in the consulship of Sulpicius Camerinus, Betteus Pompeianus being the consuls'. The calendar date in June or July, Epiphanius says, derives from speculation that Christ was born after a term of only seven months.

Epiphanius wrote the *Panarion* in the 370s, at least fifteen years before Annianus published his work. The consular names are, however, irrelevant to Epiphanius' point, which concerns only the calendar date for the Incarnation. Furthermore, as Strobel (1977: 295) has pointed out, the dating formula is corrupt, with 'Sulpicius Camerinus' appearing in the genitive and the grossly misspelled 'Betteus Pompeianus' in the dative followed by a plural 'consuls' also in the dative. Most likely, these consular names originated as a marginal gloss by a scribe familiar with the chronology of Annianus. Another copyist brought the names into the text.

4. THE ALEXANDRIAN ERA

The date for the creation in the Alexandrian year corresponding to 5493/2 BC has come to be known as the 'Alexandrian era'. The name derives from Theophanes Confessor, who completed the unfinished work of Syncellus and continued the history from the accession of Diocletian to the abdication of Michael I in AD 813. In the narrative, he continues the numbering of the years in the system of Syncellus. The work as a whole carries the heading (p. 3 de Boor), 'From the year 5777 of the cosmos to the year 6305 according to the Alexandrians, 6321 according to the Romans'. The count according to the Romans is a reference to the Byzantine era.

Ludwig Ideler (1825–6: ii. 448–9) brought the term 'Alexandrian era' into general usage among scholars, replacing the traditional 'Ecclesiastical era' deriving from Maximus Confessor (*PG* 19. 1254) and the *Aera Antiochena* of some early modern scholars. Pagi had already (1689: viii, xxv) pronounced the latter term a misnomer, stating that he could not discover its origin. It derives from a distinction between the 'Alexandrian Era' of Julius Africanus,

[8] *Panarion* 51. 29; ii. 300 Holl; ii. 60 Williams.

corresponding to 5503/2 BC (correctly, 5502/1; see Ch. 17), and the 'Antiochene Era' of Annianus and Panodorus corresponding to 5493/2—so called, I suspect, because it first appears in the writings of the Syro-Palestinian monk Cyril of Scythopolis. The term, with the now archaic spelling 'Antiochian Era', retains some currency through its use in Adam Clarke's commentary on the Bible, first published between 1810 and 1825, reprinted in a second edition many times, most recently in 1977, and now available online (http://www.preteristarchive.com/Books/1810_clarke_commentary.html, accessed 17 March 2008).

Petau attributed the invention of the Alexandrian era to Panodorus (1630; *PG* 19. 1405–6). According to Petau, Panodorus counted the year 1 from 1 Thoth = 29 August 5493 BC. He chose that year because it corresponded cyclically to the first year of Diocletian and the first year of the classical Alexandrian 19-year cycle. His younger contemporary Annianus accepted the synchronism between cosmic years and years of the 19-year cycle, but moved the beginning of the year forward to what he regarded as the first day of creation, Sunday, 25 March 5492 BC. Panodorus had abandoned the traditional synchronism established by Africanus and Hippolytus between the advent of Christ and the cosmic year 5500 or 5501. Annianus restored the mystical significance of that number by dating the Incarnation to the turn of the year 5500/1.

Georg Friedrich Unger (1867: 36–43) agreed that Panodorus was the author of the Alexandrian era. He argued, however, that its year 1 corresponded to 29 August 5494 BC, not 5493, and that Annianus adjusted it to 25 March 5492 BC. Gelzer (1898: ii. 191) accepted that argument. Rühl (1897: 191) was sceptical. D. Serruys (1907*b*) refuted Unger's arguments and restored Petau's view that the cosmic era of Panodorus corresponded to 1 Thoth 5493 BC. Grumel (1958: 86–92), however, argued that as the founder of the Alexandrian era, Panodorus must have counted his year 1 from the Sunday of creation on 19 March 5493 BC.

Most scholars have accepted, with minor nuances, both Petau's explanation of the era and its attribution to Panodorus.[9] Some have either reversed the relationship between Annianus and Panodorus or credited Annianus with the invention of the Alexandria era, without mentioning Panodorus.

In his short monograph on the history of Paschal cycles, Ferdinand Piper (1858: 113–15) attributed the Alexandrian era to Annianus, stating that Annianus built his 532-year Paschal table in such a way that its first year corresponded to the first year of the world and to the first year of a 19-year

[9] Ginzel 1906–14: iii. 289; Chaîne 1925: 9–10; Grumel 1958: 56–7; Adler 1989: 98; Wallraff 2007: xxxv.

Alexandrian cycle, producing in the year 5534 a date for the Resurrection on Sunday, 25 March. Piper does not mention Panodorus.

In a two-volume work on Egyptian chronicles, William Palmer (1861: ii: 836–8) stated that Panodorus was the younger of the two monks. Palmer believed that the work of Annianus ended after eleven Paschal periods in AD 360.

Gustav Oppert (1900: 110) argued that Annianus, not Panodorus, must have been the originator of the Alexandrian era. Panodorus would not independently have generated the odd number of 5493 as the first year of the Christian era. He was rather correcting Annianus' historically impossible date for the Passion and Resurrection in 5533/4, corresponding to AD 42.

August Strobel, in his discussion of the consular date for the Nativity in AD 9, says (1977: 297 n. 6) that Annianus established that date and Panodorus corrected it. Elsewhere in the same book, however, Strobel (1977: 405) follows the scholarly consensus in dating Panodorus to 400 and Annianus to 410, attributing the Alexandrian era to Panodorus and characterizing Annianus as the corrector of Panodorus.

Leofranc Holford-Strevens (1999: 766) agrees with Oppert. He attributes to Annianus the Alexandrian era of creation equivalent to 25 March 5492 BC and says that 'his contemporary Panodorus countered with a creation date of Sunday, 23 Phamenoth = 19 March 5493 BC'. Elsewhere (1999: 775), Holford-Strevens says that Annianus set the date of the Incarnation at AD 9 and that 'Panodorus, correcting Annianus, gave AD 1'.

Declercq (2000: 29–33) attributes the Alexandrian era to Annianus, with an explanation of its origin similar to that of Piper. He mentions Panodorus, but does not discuss his relationship to Annianus.

Petau's explanation of the origin of the Alexandrian era rests on the assumption that the Alexandrian cycle had already by the time of Athanasius been reformed such that its first year coincided with the first year of Diocletian. The Alexandrian era therefore is no more than a variant of the era of Diocletian. The attribution of this calculation to Panodorus derives from the belief that he was older and more mathematically competent than Annianus.

1 have argued in Ch. 10 that there is no evidence for a reform of the Alexandrian cycle before the time of Theophilus and Cyril. The 100-year Paschal list of Theophilus honoured the emperor Theodosius by beginning in the first consulship of Theodosius. That year, AD 380, happens to coincide cyclically with the first year of Diocletian, AD 284/285. Whether Theophilus also made that year the first year of a 19-year cycle we do not know. The earliest incontrovertible evidence for a year corresponding to the first year of Diocletian as the beginning of the cycle appears in Cyril's dedication to the

emperor Theodosius II of his own version of the cycle. It was during the time of Theophilus and Cyril that Annianus and Panodorus were at work. The cyclical correspondence between the first year of Diocletian and the year corresponding to 5493/2 BC was one of the results of the Alexandrian era of creation, rather than its source.

5. THE RELATIONSHIP OF ANNIANUS AND PANODORUS

The argument that Panodorus was the earlier of the two can be summarized as follows. In one passage (35. 7–8), Syncellus says that Annianus and Panodorus were contemporaries in the time of Theophilus. In another (396. 12–16), now speaking only of Panodorus, Syncellus says he flourished in the time of Theophilus and Arcadius. Arcadius died in 408, Theophilus in 412. In the passage where Syncellus quotes anonymously and then names Annianus and Panodorus as authorities for such views, the unnamed writer says (33. 24–7) that he will cover a period of 5904 years from Adam to Theophilus. The cosmic year 5904 corresponds to AD 411/12. Therefore, this passage must come from Annianus. Panodorus completed his work before the death of Arcadius in 408. Annianus was still at work during the last year of the patriarchate of Theophilus.[10]

i. The Year 5904

The anonymous passage consists of a series of quotations marked by 'he says'. They begin (33. 4–16) with an explanation of the Babylonian *saros* as a period of 3600 days, the *neros* as 600 days, the *sossos* as 60 days. Thus 120 *saroi* can be resolved into 1183 years, six months, and three fractions. Added to the 1057 years before these kings, there is a total of 2242 years from Adam to the Flood, in agreement with the Scriptures. There follows (33. 18–29) a general description of the writer's own work:

Then he says: Now that I have scientifically solved the ambiguous deeper meaning of the Chaldeans, I have considered it necessary first to interpret the events before the teaching of the Watchers up to the 165th year of Enoch in the year 1286. Next I proceed to outline the chronological sequence from Adam up to the 20th year of Constantine, so that by identifying according to their nation the kings who held dominion, I may show in my computation a total of 5816 continuous years.

[10] Unger 1867: 38–9; Gelzer 1898: ii. 191.

Moreover, on the basis of the men whose genealogies have been traced in divine Scriptures from Adam up to Theophilus, destroyer of idols, the praiseworthy twenty-second archbishop of Alexandria, Egypt, and the two Libyas, I shall compute the chronology, and set forth the total number of years as 5904—this so that both the heresiarchs and pagans, wise in their self-conceit, may find no basis of support in our divine Scriptures. (Translated by Adler and Tuffin 2002.)

The quotation continues for a few more lines, after which Syncellus comments in his own voice about the error of this writer in suggesting that there could be any truth whatsoever in the so-called Chaldean wisdom. Syncellus then digresses to characterize the work of Annianus and Panodorus in general, concluding with a direct quotation from Annianus refuting Eusebius' erroneous count of only 5526 years from Adam to the 20th year of Constantine.

Ideler (1825–6: ii. 447) attributed the anonymous quotation to Panodorus, conceding the possibility that it might come from Annianus. Palmer (1861: ii. 836) stated that the work of Annianus ended after 11 Paschal periods in 360, while the chronicle of Panodorus ended in the cosmic year 5904.

Unger (1867: 39) opted for Annianus, noting that the writer's criticism of pagan authors and heresiarchs better fits the more orthodox Annianus than it does Panodorus. Gelzer (1898: ii. 188–91) accepted Unger's argument. Rühl (1897: 191), Serruys (1907*b*: 260), and Ginzel (1906–14: iii. 289) all agreed in attributing the reckoning of 5904 years to Annianus and making him the later of the two scholars.

In his study of Syncellus and his sources, William Adler (1989: 149–56) restored the anonymous quotation to Panodorus. In his opinion, 'the whole section from 32. 4 to 33. 5 should be seen as a rough transcription from Panodorus, with an occasional gloss from Syncellus himself'. In their translation of Syncellus, however, he and Paul Tuffin (2002: 42–4) refrained from attributing the passage to either author in their notes to the text, while nevertheless favouring the 'general belief' that 'the excerpt originates in the chronicle of Annianus'. In the introduction, Adler and Tuffin (2002: lxx) unreservedly name Annianus as the source for the interval of 5904 years from Adam to Theophilus.

In favour of Panodoran authorship are certain similarities between the anonymous passage and a separate discussion a few pages later where Syncellus explicitly cites Panodorus. The anonymous author, dealing with Babylonian chronology, reduces their 'saroi' to 1183 years, six months, and a few days. Added to their 1057 kingless years, this interval yields a total of 2242 years to the Flood. In the later passage (42. 10–20), Syncellus quotes from Panodorus for reducing the first six Egyptian dynasties to 969 years and the two dynasties of demigods to 214½ years, for a total of 1183½ years, which added to 1058 years before these kings makes a total of 2242 years from Adam to the Flood. The variation in these texts between 1057 and 1058 reflects the fact that one period ends at 1057 and another begins at 1058.

In favour of attributing the anonymous passage to Annianus is the fact that Michael the Syrian (p. 8 Chabot) counts 1183 years and 203 days for the reign of the Chaldean kings, which he also adds to 1058 kingless years for a total of 2242 days from Adam to the Flood. Michael names Annianus as one of his sources.

The anonymous author's description of his work better fits Syncellus' brief characterization of Panodorus' work than that of Annianus. The writer describes his work as a chronicle similar to that of Eusebius, with parallel accounts of Biblical and profane histories, from Adam to Constantine, continuing on to the time of Theophilus. Syncellus characterizes Panodorus' work as 'manifold and variegated', while he says of Annianus that his work was shorter and more orthodox, consisting of eleven 532-year periods with careful notes. The chronicle that the anonymous author describes is more likely to have been the 'manifold and variegated' work of Panodorus than the *Paschoualion* that Syncellus attributes to Annianus. Furthermore, Michael the Syrian explicitly states that the work of Annianus ended with the reign of Constantine. In that case it covered only the 5816 years from Adam to the 20th year of Constantine, not the full 5852 years of eleven Paschal periods, nor the 5904 years of the unnamed author.

ii. Annianus and the Year 5534

According to Syncellus, Annianus dated the Resurrection to 25 March, the first day of the year 5534. The date corresponds to AD 42. In that year the Alexandrian calculations produce a 14th day of the moon on Thursday, 22 March.

In the prologue to his 100-year list of Paschal dates, Theophilus established the doctrine that Christ was betrayed on Thursday, the 14th day of the moon, suffered on Friday the 15th of the moon, and rose from the dead on Sunday, the 17th day of the moon (Krusch 1880: 225; see Ch. 10). As Ideler argued (1825–6: ii. 453), Annianus decided to date the Passion to the year corresponding to AD 42, because only for that year did the Alexandrian calculations produce an Easter Sunday on 25 March and on the 17th day of the moon. Accepting the long chronology for the career of Jesus, Annianus numbered that year as 5534 and arrived at the consulship of Camerinus and Poppaeus for the year of the Incarnation, numbered as 5501.

Ideler never definitively stated whether he thought Annianus or Panodorus to have been the first to establish the Alexandrian era. Oppert was right. It must have been Annianus. It defies belief that someone—namely, Panodorus—could independently have established a world-era based on the era of Diocletian, with a date for the Nativity in the year 5493, and that a younger contemporary would have discovered that the year 5534 in that very same chronological system contains the right astronomical data for the Passion. Annianus established a world-era in which the year 5534 began on Sunday, 25 March AD 42. Panodorus pointed out that Christ could not have been born in the year 5500/1 in this system and resurrected in 5534, because those dates were inconsistent with the chronology of the Roman emperors and the testimony of the Gospels.

Declercq (2000: 30–3) has offered an explanation of the Alexandrian era similar to those of Piper and Ideler. Annianus looked in the Alexandrian tables for an Easter date that would both fulfil the requirements of Theophilus and preserve the tradition that Christ rose from the dead on Sunday, March 25th. Projecting the tables of Theophilus forward for another 100 years, he found such a date at the year corresponding to the 290th year of Diocletian, AD 574. Using the 532-year Paschal period, Annianus assumed that the year of the Passion was 532 years earlier. Accepting the long chronology for the ministry of Jesus and the now traditional synchronism between the Incarnation and the cosmic year 5500, Annianus would want to assign to the year of the Passion the number 5533 or 5534. Declercq suggests that he chose 5534 because the resulting year 1 would correspond to the first year of Diocletian and the first year of a reformed Alexandrian cycle.

Such an explanation is essentially correct. As I have argued in Ch. 10, however, there is no evidence before the time of Annianus that the Alexandrian cycle had already been reformed such that its first year corresponded to the first year of Diocletian. Annianus chose 5534 over 5533 because the resulting year 1 produces a date for creation on Sunday, 25 March.

6. THE COSMIC ERA OF PANODORUS

We can be certain about the world-era of Annianus as corresponding to 25 March 5492 BC. The evidence for the cosmic year of Panodorus is more difficult. Even if he was not the founder of the Alexandrian era, he evidently used it in his chronicle. We know that he dated the beginning of the Babylonian kingdom to the cosmic year 1058, that he agreed with Annianus in dating the Vicennalia of Constantine to 5816, and that he calculated 5904 years to his own time, during the patriarchate of Theophilus. What we do not know is whether Panodorus agreed with Annianus in reckoning the years from a date for creation in March, or used the standard Alexandrian reckoning from 1 Thoth = 29 August.

Most scholars believe that Panodorus synchronized his cosmic year with the Alexandrian civil year beginning on 1 Thoth = 29 August.[11] Grumel (1958: 86–92) argued, however, that Panodorus' era of creation must, like that of Annianus and Syncellus, have begun in the springtime, but a year earlier on 19 March 5493 BC. If it was Annianus, rather than Panodorus, who first established the Alexandrian era of creation, Grumel's argument loses its foundation. Panodorus could well have accepted the date of 25 March 5492 BC, as the Sunday of creation, while backdating the beginning of the year 1 proleptically to 1 Thoth 5493 BC.

The significance of the Panodoran date for the Incarnation and/or the Nativity in the cosmic year 5493 depends on the absolute date for the first day of that year. The data are not all mutually consistent, and some of the numerals may be corrupt in the text.

i. The 7-Year Error of Panodorus

Syncellus consistently (35. 34, 378. 8, 396. 15) complains of a 7-year error on the part of Panodorus in reckoning the date of the Incarnation. Yet the interval between the year 5493 that Syncellus attributes to Panodorus (378. 9, 396. 15, 397. 9) and the year 5501 that he himself accepts (380. 19–382. 4) from Annianus and Maximus is eight years. Serruys (1907*b*: 259) accounted for the difference between seven years and eight on the basis of the six months' difference between the world-era of Panodorus and that of Annianus. Grumel (1958: 90) thought Syncellus made a mistake and that Panodorus had actually dated the Incarnation to 5494.

The solution to the problem requires neither appeal to different calendars nor 'correction' of the numeral. Syncellus thinks everyone should agree with Julius Africanus and with Hippolytus in dating the Incarnation in the year 5500. He says (376. 26) that this is the whole point of his work. Of Africanus he says (395. 19–20), 'Africanus, in agreement with the apostolic tradition, dated the divine Incarnation in the year 5500.' Thus a date in 5493 represents a seven year-error with respect to what Syncellus believes to be the firm tradition of the church. Syncellus finesses the point for Annianus by emphasizing (381. 5–15)

[11] Ideler 1825–6: ii. 447; Rühl 1897: 191; Serruys 1907*a*, 1907*b*; Ginzel 1906–14: iii. 289.

that the Annunciation took place not during the year 5501, but at midnight at the end of 5500 and the beginning of 5501.

Syncellus (396. 12–397. 10) finds the source of the 7-year error in the fact that Panodorus followed the Astronomical Canon for the chronology of the Ptolemies and thus counted 294 years from the first year of Philip (half-brother and successor of Alexander) to the last year of Cleopatra, followed by 43 years of Augustus. The extant copies of the Astronomical Canon agree with these numbers (Mommsen 1898: 448–9).

Syncellus says (397. 7–8) that Panodorus dated the first year of Augustus to 5451 and the last to 5506. Beginning, as Syncellus says (396. 22) everyone does, from 5170 as the first year of Philip, and adding the intervals of 294 and 43, one will arrive at 5507 for the first year of Tiberius, so that the last year of Augustus would be 5506.

In the Astronomical Canon, the first year of Tiberius began on 1 Thoth, 337 years after the first year of Philip. Alexander the Great died in June of 323.[12] The Astronomical Canon uses the system of backdating the first year of a monarch to the beginning of the civil year during which he became king. Therefore, the first year of Philip began 1 Thoth 324 BC, corresponding in the Egyptian mobile calendar to 12 November. The first year of Tiberius began 337 years later on 1 Thoth AD 14, corresponding to 29 August in the now reformed calendar of Alexandria, 20 August in the mobile calendar. The date is consistent with the statements of Suetonius (*Augustus* 100. 1, *Tiberius* 24. 2) that Augustus died on 19 August and that some time elapsed before Tiberius agreed to accept from the senate the powers of the principate. Thus the last year of Augustus began 1 Thoth AD 13 in the Astronomical Canon. Syncellus says Panodorus numbered that year as 5506. Accordingly, the year that he numbered as 5493 began 1 Thoth 1 BC, and his year 1 of the world began 1 Thoth 5493 BC.

That Panodorus used the Alexandrian civil year follows from the comments that Syncellus makes about the numbering of the years of Augustus. He explicitly states (396. 20–1) that both the Astronomical Canon and the astronomer Claudius Ptolemy fixed the era of Philip as beginning from 1 Thoth, equivalent to 29 August. Syncellus says (396. 30–397. 1) that he himself, if he were to follow the Astronomical Canon, would reckon the death of Augustus in the year 5505, which would be the fifth year of the Saviour's age. Strictly speaking, the year 5505 would be the fifth of the Saviour's era, but not of his life. Syncellus (384. 10–11) labels the year 5505, as the fifth from the Incarnation. If Panodorus counted his years, in agreement with the Astronomical Canon, from 1 Thoth = 29 August, while Syncellus following Annianus

[12] Diodorus 17. 113–17; Arrian, *Anabasis* 7. 28; Depuydt 1997.

reckoned from 29 Phamenoth = 25 March, six months later, then the last year of Augustus beginning on 1 Thoth 5506 for Panodorus would have been 1 Thoth 5505 for Syncellus.

In a somewhat enigmatic comment on the passage, Heinrich Gelzer (1898: ii. 247) said that Panodorus in calculating the year 5506 actually reckoned 5170 as the last year of Alexander, rather than the first of Philip. Thus the interval of 294 + 43 = 337 should have brought him to 5507 for the last year of Augustus. In arriving at 5506, Panodorus must have departed from the Astronomical Canon, subtracting one year from the reign of the Ptolemies.

Gelzer's argument contradicts the statement of Syncellus that everyone agreed on 5170 as the first year of Philip. The year 5506 is the number that the extant versions of the Astronomical Canon would yield for the last year of Augustus, if the first year of Philip were designated as 5170; and 5506 is the number that Syncellus attributes to Panodorus.

In his own numbering of the years of Augustus, Syncellus is not entirely consistent, but he seems to have synchronized his regnal years with the cosmic year. At the year of the Incarnation, Syncellus says (380. 1–381. 22) that the year 5500 was the 42nd year of Augustus, while the Annunciation took place on 25 March 5501, the 43rd year of Augustus. Elsewhere (368. 9–10), he says the first year of Augustus was 5458 and the year 5460 was the end of the second year of Augustus and the beginning of the third. In another passage (385. 25–386. 18), he says that Augustus ruled for 56 years and dates the first year of Tiberius to 5515, which implies 5459 for the first year of Augustus.

ii. The Introduction of Leap Year at Alexandria

In a more problematic passage at 377. 7–378. 9, Syncellus also attributes the 7-year error to Panodorus' numbering of the years of Augustus, because he was too eager to follow the mathematicians. Here Syncellus is commenting on the adoption at Alexandria of the Julian year of 365¼ days, with the intercalation of one additional day every four years. Syncellus states, using the Roman terminology, that the 'so-called bissextile year' was introduced in the year 5472 of the world, which corresponds according to accurate chronology with the 15th year of Augustus, the sixth year from the fall of Alexandria. He explains the cycle of 1460 (365×4) years through which a given date in the Egyptian mobile calendar recedes with respect to the solar year until returning to its start. He then says that it was during the 15th year of Augustus that the cycle returned to its start. Here, however, he synchronizes that year with the year 5471, instead of 5472. He adds that Panodorus counted the year as the 22nd of Augustus, following authorities that placed the fall of

Alexandria in the 16th year of Augustus and the introduction of leap year in the fifth year after that.

For clarification of the underlying historical facts, we have other witnesses. Theon of Alexandria drafted a list of Roman consuls for the period from 138 to 372 (Mommsen 1898: 375–81). He coordinates the list with the Astronomical Canon by including two columns with a running count of the years from the death of Alexander and from the first year of Augustus. There is also a column with a number from 1 to 4 indicating the position of the year in the leap-year cycle and a column counting the number of intercalary days since the beginning of the system. From those numbers it is possible to calculate the first year of the first four-year cycle.

Theon's list begins with the consulship of Antoninus Pius and Camerinus (correctly, Niger and Camerinus), numbered as the year 461 from Alexander, 167 from Augustus, 2 in the leap-year cycle, with 40 leap days accumulated. That consular year corresponds to AD 138, the Alexandrian year 137/8. That is the second year of a leap-year cycle, because the Alexandrians inserted the leap day before 1 Thoth of the year during which the Romans intercalated a day sixth months later in February. Thus 135/6 was a leap year, and 136/7 was the first year of the next cycle. The accumulation of 40 leap days indicates that the year 136/7 was the year 161 since the beginning of the first 4-year cycle. The system therefore began in 25/4 BC. By the Astronomical Canon, that was the sixth year of Augustus.

Theon comments on the system in his commentaries on the *Handy Tables* of Ptolemy. 'Now this period of 1460 years, commenced from a certain time, terminated in the 5th year of the reign of Augustus so, from the last epoch, the Egyptians begin all over again to find themselves every year one quarter of a day in advance' (*Lesser Commentary*: 203–4).

Theon's count of the intercalary days is consistent with that of Vettius Valens, an astrologer of the second century AD.[13] Vettius Valens (1. 9) counts 148 full years with 36 embolismic days from Augustus to the fourth year of Hadrian. In the Astronomical Canon, Hadrian 4 is Augustus 149, corresponding to AD 119/20, which was a leap year, according to Theon. If the 36th leap day was inserted before 1 Thoth of AD 119, then the first leap day was 140 years earlier in 22 BC.

Similar information comes from Al-Biruni. In one passage (p. 33) he says that Augustus caused the people of Alexandria to give up their system of reckoning by non-intercalated Egyptian years in the sixth year of his reign. In another passage (p. 58) he says that when Augustus conquered Egypt five years remained until the end of the great intercalation period. Therefore, he

[13] I owe the reference to Leofranc Holford-Strevens.

waited until five years of his rule had elapsed, and then ordered the people to intercalate one day into the months in every fourth year.

The first year of Augustus began on 1 Thoth of 30 BC in the Astronomical Canon. The next leap days at Rome, if they had been regularly intercalated, would have been in February of 29, 25, and 21 BC. In Alexandria, the next leap days would be in August of 26 BC and 22 BC and the next 4-year cycles would begin on 1 Thoth = 29 August of 25 BC and 21 BC. The sixth year of Augustus began 1 Thoth 25 BC.

In fact, leap days were not correctly intercalated at Rome during this period. A bissextile day was actually intercalated at Rome every three years, beginning in 42 BC, with the year 30 BC therefore a leap year.[14] Walter Snyder (1943), reviving an argument of Ideler (1825–6: i. 153–61), claimed that Augustus introduced the reform in his first year at Alexandria, ordering a new Julian cycle to begin on 1 Thoth = 29 August of 30 BC. For the next several decades, the Alexandrians followed the erroneous Roman practice until Augustus corrected the errors and put a true Julian cycle into effect from AD 5, with the first regular leap day in AD 8. A. E. Samuel (1972: 177) accepted this argument. Leofranc Holford-Strevens (1999: 709–10) has rejected it. The papyrological evidence giving dates in both the Roman and Egyptian calendars during the reign of Augustus permits no definitive conclusion (Bennett 2003).

The issue does not affect the present discussion. Theon, Al-Biruni, and presumably Panodorus too reckoned the reform on the basis of a theoretically correct, retroactively calculated calendar, whether or not the result reflected the actually observed calendar during the period between 30 BC and AD 8.

Censorinus (18:10) says that a 'great year' among the Egyptians was supposed to begin when the rising of the Dog star (Sirius or Sothis) coincided with the first day of Thoth and that such a coincidence occurred on 21 July during the consulship of Antoninus Pius and Bruttius, AD 139. The correct date of 1 Thoth in the mobile calendar for that year was 20 July. The Sothic cycle to which Censorinus refers is one of the most complex and controversial problems in Egyptian history.[15] It is entirely different from the 1460-year intercalary period the Alexandrian astronomers numbered from 1 Thoth = 29 August 25 BC for the purposes of coordinating the traditional mobile calendar with the fixed Roman calendar.

What we learn from Theon and Al-Biruni is that the Alexandrian astronomers deemed one 1460-year period to have ended in the fifth year of Augustus and a new period to have begun in the sixth year of Augustus.

[14] Macrobius 1. 14. 13–15; Hannah 2005: 118–20.

[15] Ginzel 1906–14: i. 187–93; Shaw 2000: 10–11, with bibliography 440.

The sixth year of Augustus was the first year of the first 4-year period in the reformed calendar, which began on 1 Thoth = 29 August of the year corresponding to 25 BC. The first actual leap day was inserted as an extra day before 1 Thoth in August of 22 BC. With that day counted as the first leap day, the 40th embolismic day was inserted before 29 August AD 135, and the year 137/8 was the second year of the next cycle, as Theon says. In other words, Theon counted the leap day as belonging to the beginning of the year 135/6, making that year the fourth of a leap-year cycle.

Syncellus says that in the cosmic year 5472, the 15th year of Augustus and the sixth from the fall of Alexandria, the bissextile year was introduced. After a digression to explain the 1460-year period, he says that such a period returned to its start on the 29th day of August in the 15th year of Augustus and the cosmic year 5471. Panodorus made it the 22nd year of Augustus, because he followed 'many authorities' in dating the fall of Alexandria to the 16th year of Augustus.

Scholars have debated whether 5471 or 5472 is the right number in this passage. Unger (1867: 34–7) claimed that 5472 is the correct number, because Syncellus elsewhere (397. 7–10) says that Panodorus dated the last and 56th year of Augustus to 5506. The 22nd year must therefore be 5472. Unger maintains that 5472 was the end not of a 1460-year period, but the year at the end of which the first leap day was intercalated. That year corresponded to 23/2 BC. The year 1 of Panodorus therefore began, according to Unger, on 29 August 5494 BC.

Serruys (1907*b*: 254–5) argued that 5471 must be the correct number, because that year was the 21st year of Augustus according to Panodorus, and Syncellus explains the discrepancy as resulting from the sum of the 16th year of Augustus and the fifth year thereafter. Therefore Serruys emended '22nd year' to '21st year' and '5472 to '5471'. According to Serruys, 5471 was the year of the first bissextile day, inserted at the end of the year 23/2 BC. If the year 5471 corresponded to 23/2 BC, then the year 1 began on 1 Thoth 5493 BC.

No emendations to the text are necessary. The cosmic year 5472 at the beginning of the passage is consistent with the chronology for Augustus that Syncellus gives elsewhere. He states several times that the first year of Augustus was 5458 (368. 6, 380. 15, 397. 6). Therefore his 15th year was 5472. Syncellus says that Panodorus dated the first year of Augustus to 5451, the last to 5506. Therefore the 22nd year was 5472.

The best way to account for the variation between 5471 and 5472 is to assume that Panodorus was discussing something that happened at the end of one Alexandrian year and the beginning of the next. He apparently designated this occurrence as coming at the end of 5471 and the beginning of 5472.

The end of one 1460-year period and the beginning of the next is such an event and requires 1 Thoth as the date for the turn of the year 5471/2. The correct date for the beginning of the new system was 25/4 BC, which should have been 5468/9 in the cosmic chronology of Panodorus.

Syncellus mentions 'the first bissexton' as having been introduced at this time. The first leap day was intercalated as a sixth epagomenal day at the end of the Alexandrian year 23/2 BC. It is clear from the way that Theon designates bissextile years in his consular list that the year 22/1 BC was considered the first leap year. If it was specifically the first leap day that Panodorus dated to 5471/2, then again his year must have begun on 1 Thoth. For all its difficulties, this passage is the best evidence for the hypothesis that Panodorus synchronized his cosmic years with the Alexandrian civil year beginning 1 Thoth = 29 August. In the system that Theon followed, the first leap day was inserted in 22 BC. If that was the end of 5471 and the beginning of 5472, then the cosmic year of Panodorus had an epoch corresponding to 1 Thoth = 29 August 5493 BC.

It is not likely that Panodorus himself misunderstood the system and thought that the insertion of the first intercalary day represented the end of one 1460-year period and the beginning of another. That Syncellus thought so can be explained. Syncellus counts 5458 as the first year of Augustus in Rome. He says (365. 10–11) that Cleopatra ruled for 22 years beginning in 5446. The 22nd and last year of Cleopatra was therefore 5467. Accordingly, the first year of Augustus in Alexandria was 5468, the 11th year of Augustus at Rome. For Syncellus, the 15th year of Augustus was his fifth year at Alexandria and the sixth year from the fall of Alexandria, corresponding to 5472. He therefore confused Panodorus' date for the first leap day at the turn of the year 5471/2 with the tradition that a 1460-year period ended in the fifth year of Augustus.

Syncellus tries to explain why Panodorus numbered the year 5472 as the 22nd of Augustus, instead of the 15th. He says that 'many' authorities count the fall of Alexandria as the 16th year of Augustus and number his years from that point, after which in the fifth year of Augustus the quadrennial day was introduced. The Alexandrians, he adds, still number their Astronomical Canon in this way. Thus Panodorus, wanting to agree with these authorities, made his 7-year error.

Syncellus' explanation of the 7-year error cannot bear scrutiny. In the first place, his arithmetic is not quite right. The 16th year plus the 5th year yields the 20th year, not the 21st, much less the 22nd. Furthermore, his claim that 'many' authorities, including the Alexandrian astronomers, numbered the years of Augustus at Alexandria from his 16th year at Rome is not true. Indeed, Syncellus says elsewhere (376. 13) that 'the Alexandrians number the years of Augustus from the 14th year'.

According to Syncellus (396. 12–397. 10), Panodorus dated the first year of Augustus to 5451 and his last year to 5506, while also following the Astronomical Canon in giving him 43 years of rule at Alexandria. Thus, if 5506 was the 43rd year at Alexandria, the first year was 5464, the 14th year of Augustus.

We do know of one authority who numbered the last year of Cleopatra as the 15th year of Augustus, so that his first year at Alexandria would be his 16th at Rome. In his *Ecclesiastical History* (1. 5. 2), Eusebius of Caesarea dated the birth of Jesus to the 42nd year of the rule of Augustus, and the 28th year 'from the subjection of Egypt and the death of Antony and Cleopatra, who was the last of the Ptolemaic dynasty in Egypt'. Eusebius counts the 28th year from the fall of Alexandria and the last year of Cleopatra, rather than from the first year of Augustus at Alexandria. The synchronism between the 28th and 42nd years dates the fall of Alexandria to the 15th year of Augustus—that is, 14 years after his first year at Rome. Similarly, in his chronicle (p. 163 Helm, 210 Karst), Eusebius aligned the years of Cleopatra with the years of Augustus such that the 22nd and last year of Cleopatra was synchronized with the 15th year of Augustus.

In the Armenian version, there is a note at the 16th year of Augustus: 'From here some count the first year of the monarchical rule of Augustus; others, however, at Alexandria, from the 14th.' That note does not appear in Jerome's version, which has instead at the year numbered as the 13th of Augustus the note that 'some number the first year of the monarchy of Augustus from this point'.

As I have suggested elsewhere (1979: 77–8), the Greek exemplar of the *Chronicle* of Eusebius from which the Armenian version derived may have been a redaction of that work incorporated into the chronicle of Panodorus. The note in the Armenian version at the 16th year of Augustus derives from this redaction and probably comes from the hand of Panodorus.

Panodorus did not himself date the first year of Augustus at Alexandria to his 16th at Rome. What he did was add a note correcting Eusebius on this point and stating that the Alexandrians number the years of Augustus from his 14th year at Rome. Syncellus was searching for a way to explain the 7-year error of Panodorus. He seized upon this note in the chronicle of Panodorus at the 16th year of Augustus and tried, rather ineptly, to build a case from it.

iii. The Date of the Passion

Syncellus says (35. 34–36. 4) that because of his 7-year error in the date of the Incarnation, Panodorus was also wrong about the Paschal day, which he dated to the year of the world 5525 on 20 March [*sic*!], which was the Egyptian 20

Phamenoth [*sic*!]. Syncellus says elsewhere (397. 9) that Panodorus counted 5506 as the last year of Augustus. The year 5525 was therefore the 19th year of Tiberius. The correct date for the 19th year of Tiberius according to the Astronomical Canon was AD 32/3. If Panodorus numbered that year as 5525, then again it follows that his cosmic era corresponded to 1 Thoth = 29 August 5493 BC.

Syncellus also (394. 1–3) quotes the note on the Passion from the chronicle of Eusebius as stating that Christ went to the Passion in the 19th year of Tiberius. The Armenian version of the chronicle of Eusebius (p. 213 Karst) agrees on this datum, as does the Syriac epitome (Schoene 1866: 209). Jerome, however (p. 174 Helm), translates the same note with the phrase '18th year of Tiberius'.

Richard Burgess has argued that Syncellus, the Armenian translator, and the Syriac epitomator preserve the original wording of Eusebius. According to Burgess (2002: 26 n. 54), 'Jerome moved the date of the crucifixion from 19 Tiberius to 18 Tiberius.' As I have argued in Ch. 14, the '18th year' must have been the original reading in the *Chronicle* of Eusebius. In the same note, Eusebius cites the Gospel of John for a public ministry of three years after the 15th year of Tiberius. In the *Ecclesiastical History* (1. 10), he says that Jesus was baptized in the 15th year of Tiberius and that the period of his teaching was less than four full years.

The hypothesis that both Syncellus and the Armenian translator knew the chronicle of Eusebius through the redaction of Panodorus will account for their attribution to Eusebius of a date for the Passion in the 19th year of Tiberius, instead of the 18th year.

Syncellus criticized Panodorus not only for dating the Passion to 5525 instead of 5533, but also for missing the correct 'Paschal (*paschalion*) day'. In the sole manuscript extant for this portion of the text, Syncellus' remark is excessively abbreviated, and the text is partially corrupt. The text says Panodorus erred 'concerning the Paschal day', using a definite article in the neuter gender, although the Greek word for 'day' is feminine. Jacob Goar, who published the first edition of the text in 1652, emended the article to make it feminine, and that must have been the original reading. A copyist mistook the adjective *paschalion* for a neuter noun.

The text also says that Panodorus put the day as 20 March, equating that day with 20 Phamenoth. The 20th day of the Roman month March corresponds to the 24th day of the Egyptian month of Phamenoth in the Julian calendar, while 20 Phamenoth corresponds to 16 March. In the mobile calendar, 20 Phamenoth would have corresponded to 1 or 2 March during the 30s AD and 20 March to a date in Pharmouthi.

Goar proposed emending 20 Phamenoth to 24 Phamenoth. Unger (1867: 42), followed by Gelzer (1898: ii. 248), preferred to make the converse correction from 20 March to 16 March. In the year corresponding to AD 32, 16 March was a Sunday. If that was Panodorus' year 5525, Unger found confirmation for his hypothesis that the cosmic era of Panodorus began in 5494 BC, not 5493. Neither emendation is credible. Working in the early fifth century, Panodorus would not have dated the equinox before 21 March or the 14th day of the moon before the equinox.

Oppert (1900: 111) argued that Panodorus agreed with Annianus in dating the Resurrection to 25 March, but moved the date to the year corresponding to AD 31—the traditional date prior to the time of Annianus. That hypothesis requires emending the text from 5525 to 5523.

Serruys (1907*b*: 256–9) emended the calendar dates to 21 March and 25 Phamenoth in order to make Panodorus refer to AD 34, in which year 21 March was a Sunday and the 14th day of the moon. To set the date of the first Easter on 21 March of that year would contradict Alexandrian orthodoxy. Theophilus states that in a year when the 14th day of the moon on or after the equinox falls on a Sunday, the Paschal observance should be deferred until the following week (Krusch 1880: 220–6). Serruys therefore argues that the complaint about missing the Paschal day refers to this rule. According to Serruys, it was the 14th day of the moon that Panodorus dated to 21 March AD 34; and Syncellus or his source misunderstood the date as being for Easter Sunday. If the year was AD 34, however, this will have been 5526 by the usual understanding of the epoch as counted from 29 August 5493 BC—an interpretation that Serruys defends. Having moved Panodorus' date for the Passion from 5525 to 5526, Serruys also moves the date of the Nativity from 5493 to 5494.

Grumel (1958: 86–91) agreed that the year must have been AD 34, but he retained the 20 March of the text and argued that Panodorus set the 14th day of the moon on Saturday, 20 March, and Easter Sunday on 21 March, thus violating the rule of the equinox. He believed that Panodorus somehow justified this departure from the usual rules. Grumel also emends the number '5525' to '5526' to suit his redating of the era of Panodorus to 19 March 5493 BC.

It is not methodologically acceptable to emend a numeral (5525) that is clearly correct on the basis of other numerals (20 March = 20 Phamenoth) that are clearly corrupt.

For Panodorus, the year 1 began on 1 Thoth 5493 BC. The year 5525 therefore began on 1 Thoth AD 32, and the data for Easter belong to AD 33—the date preferred by many modern scholars for the year of the Passion (see Ch. 3). That year presents calendrical data for Easter that come very close to meeting the requirements of Theophilus. In the year 33, the date of the Paschal full moon by the Alexandrian calculation was Wednesday, 1 April, and Easter Sunday was 5 April. The year 32/3 was the 19th year of Tiberius according to the Astronomical Canon. Panodorus therefore dated the Passion to the 19th year of Tiberius and corrected the entry in the chronicle of Eusebius accordingly. Syncellus' criticism that he missed the correct Paschal 'day' probably refers to his failure to preserve Sunday, 25 March, as the date of the Resurrection. The original reference of the now corrupted calendar dates in the text is lost beyond recovery.

Syncellus (388. 22–389. 15), apparently following Annianus, dated the Passion to 23 March at the end of the cosmic year 5533, the year 213 of the 11th 532-year period and the 19th year of Tiberius. Annianus dated the Nativity (381. 5–22) to the 43rd year of Augustus, 25 December of the year 5501. Panodorus corrected the absolute dates to 5525 and 5493, maintaining both the interval of 32 years plus three months and the regnal years of the emperors. For Annianus, the Passion had taken place at the end of the 19th year of Tiberius and the Resurrection at the beginning of the 20th. Recalibrating the Alexandrian era to synchronize it with the Alexandrian civil year, Panodorus brought both the Passion and the Resurrection into the 19th year of Tiberius.

7. THE DATE OF THE NATIVITY

With the year 1 dated from 1 Thoth = 29 August 5493 BC, the year 5493 began 1 Thoth 1 BC. Unfortunately, Syncellus does not make it clear whether this was the year of the Nativity according to Panodorus, or of the Incarnation.

Syncellus himself, following Annianus, made a clear distinction between the Incarnation and the Nativity, dating the former to 25 March, the latter 275 days later to 25 December (381. 5–20). He uses a form of the word *sarkosis*, 'enfleshment', for the Incarnation, *gennesis*, 'generation', for the Nativity. When he criticizes Panodorus, sometimes it is the Nativity that Syncellus says he dated wrongly to the year 5493, sometimes he uses a word that can mean either Incarnation or Nativity. Since the year 5493 for Panodorus covered the period from 29 August 1 BC to 28 August AD 1, the Incarnation and the Nativity could belong to two different cosmic years.

In his only extended discussion of the matter (396. 12–397. 10), Syncellus begins by saying that it was the Incarnation (*sarkosis*, 396. 15) that Panodorus dated to 5493, but concludes by stating that it was the Saviour's birth (*gennesis*, 397. 10) that Panodorus wrongly dated to 5493. At 35. 31 he says that Panodorus made a 7-year error in reckoning the date of the Lord's 'taking of human form' (*enanthroposis*, 36. 2), but concludes by saying that he erred in the year of the Saviour's birth (*genethlion*, 36. 4). In that passage, Syncellus complains of the 7-year error, but he does not mention the number 5493. At 378. 8–9, Syncellus says that Panodorus missed the target of 5500 by seven years, reckoning 5493 instead. There he makes reference neither to the Incarnation nor to the Nativity.

This ambiguity has led scholars to interpret the significance of the year 5493 in different ways. Gelzer (1898: ii. 191, 248) maintained that Panodorus must have made a distinction between the Incarnation and the Nativity. He therefore asserted that Panodorus dated the Incarnation to March of the year 5492 and the birth nine months later to December 5493. Gelzer follows Unger in dating the cosmic era of Panodorus 1 Thoth 5494 BC. The Nativity in 5493 therefore corresponds to December of 2 BC.

Oppert (1900: 110–11) argued that 5493 was the first year of the Christian era, and that Panodorus actually dated the Nativity to 5492. Serruys (1907*b*: 258–9) claimed that Panodorus must have dated the Incarnation to 5493 and the birth to 5494. Only thus, according to Serruys, can we understand Syncellus' complaint about a 7-year error. Serruys dates the epoch of Panodorus to 1 Thoth 5493 BC. For Serruys, therefore, both the Incarnation and the Nativity belong to the year AD 1.

Grumel (1958: 90) thought that Syncellus made a mistake in attributing the year 5493 to Panodorus as a date for either the Incarnation or the Nativity. Believing that Panodorus was the original inventor of the Alexandrian era of creation, he argued that his first year from Creation began on 19 March of 5493 BC. Panodorus must have said that the Incarnation took place at the end of 5493 and beginning of 5494. Grumel concludes that Panodorus dated both the Incarnation and the birth to the year 5494—hence the complaint of a 7-year error. For Grumel, Panodorus' year 5494 began 19 March AD 1.

The complaint of a 7-year error arises partly from comparing 5493 with 5500, partly from the 7-year difference between Syncellus and Panodorus in numbering the years of Augustus. There is no reason to introduce the year 5494 into the discussion.

The words 'Incarnation (*sarkosis*)' and 'inhumanizing (*enanthroposis*)' are generic. They refer to the whole phenomenon of 'the Word made Flesh'. The words *gennesis* and especially *genethlion* refer specifically to birth.

The word *genethlios* is an adjective, but *genethlion* and its plural *genethlia* are often used as nouns. Whether in adjectival or substantive form, these are the ordinary words in Greek for 'birthday'. Plato (*Symposium* 203 c) uses *genethlia* for the birthday of Aphrodite. The author of the *Chronicon Paschale* (22. 1) criticizes those who do not observe the *genethlion* of Christ on 25 December. There is a particularly relevant passage in the Byzantine synaxarium for 30 December, commemorating the 20,000 martyrs of Nicomedia, when the emperor Maximian set fire to the cathedral on Christmas Day, killing almost all of the worshippers:

> The church was full on the birthday (*genethlion hemeran*) of our Lord Jesus Christ and the people in our part of the world were celebrating the ineffable Incarnation (*sarkosin*). At the order of the emperor, a fire was set encircling the church, because the people refused to obey the order to exit and sacrifice to idols. A great crowd died in the fire, to the number of 20,000. (*Synaxarium Mensis Decembris,* Day 30, Section 2, 49–56.)

The passage shows that *genethlion* and *sarkosis* can be used interchangeably, with no distinction between Incarnation and Nativity. The use of *genethlion* in Syncellus' criticism of Panodorus strongly suggests that it was the Nativity that Panodorus dated to the cosmic year 5493.

The year 5493 began 1 Thoth = 29 August of the year corresponding to 1 BC. A date for the birth of Jesus on 25 December 1 BC agrees with the date implied by Dionysius Exiguus in his numbering of the years of the Lord such that the year 532 corresponds to the year 248 of Diocletian, AD 531/2. As I pointed out in Ch. 15, we do not know whether Dionysius intended his years of the Lord to be synchronized with the indictional year beginning from 1 September, or from the beginning of the Roman civil year on 1 January four months later.

Clement, Hippolytus, Eusebius, and most other ancient authorities dated the Nativity to the year corresponding to 2 or 3 BC, doing so on the basis of Luke's statement that Jesus was about 30 years old when baptized during the 15th year of Tiberius. I left open in Ch. 14 the possibility that Julius Africanus might have anticipated Dionysius in placing the Nativity in a year corresponding to 1 BC. In that case, Panodorus did not generate a new date for the Nativity, but reaffirmed against Annianus the date that Africanus had made traditional in the Alexandrian church. To the chronological system of Julius Africanus we must therefore now return.

17

The Christian Era of Julius Africanus

1. JULIUS AFRICANUS

Eusebius says in his *Ecclesiastical History* (6. 31) that a person whom he calls simply 'Africanus' was a prominent writer in the time of the emperor Gordian (238–44). He wrote, Eusebius says, a book entitled *Kestoi*, a letter to Origen contesting the authenticity of the story of Susannah included at the end of Greek versions of the book of Daniel, five books of chronology with great devotion to accuracy, and a letter addressed to Aristides dealing with the harmony of the Gospels. Eusebius quotes Africanus in the book 'On Chronology' as having stated that he visited Alexandria in the time of the philosopher Heraclas. Of Heraclas, Eusebius says (6. 3, 26, 35) that he was an accomplished philosopher who converted to Christianity, succeeded Origen as head of the catechetical school in Alexandria, and eventually became bishop of that city, serving for sixteen years from the 10th year of the emperor Alexander Severus (231) until the third year of Philip (246).

In the *Chronicle*, Eusebius says that the Palestinian town of Emmaus was refounded as Nicopolis as a result of a successful embassy on the part of the chronicler 'Julius Africanus'. In Jerome's version (p. 214 Helm), the entry appears at Abraham 2237, aligned with the third year of Elagabalus and the first year of the 250th Olympiad (221/2). The Armenian text (p. 224 Karst) has the note at Abraham 2237, aligned with the second year of Elagabalus and the second year of the 250th Olympiad.

The Byzantine encyclopaedia known as the *Suda* says (alpha, 4647) that Africanus, also named 'Sektos', was a 'Libyan' philosopher who wrote the *Kestoi* in 24 books. Scaliger (1606*a*: 212 = 1658: 232) emended 'Sektos' to 'Sextus' and suggested that Sextus Africanus the Libyan and author of the *Kestoi* was one person, while Julius Africanus, the author of the *Chronicle* was another. Heinrich Gelzer (1898: i. 1–5) refuted this idea and entitled his monumental study *Sextus Julius Africanus und die byzantinische Chronographie*. It is not customary in any case to include the praenomen in reference to ancient writers. Recent scholars generally refer to the author only as 'Julius Africanus'.[1]

[1] Kroll 1917; Granger 1933; Adler 1989: 10 *et passim*; Wallraff 2006: v.

Gelzer (1898: i. 4–5) believed the *Suda* was correct to make Africanus a native of Roman North Africa. A papyrus fragment (*P. Oxy.* 412) of the 18th book of the *Kestoi* published after Gelzer had completed his work suggests that he was in fact a Palestinian (Kroll 1917). The *Suda*'s epithet 'Libyan' is a false inference from the name Julius Africanus. In Greek, 'Libya' refers to the whole continent of Africa (Herodotus 4. 42).

The *Kestoi* was an encyclopedia, quite popular in its time. Jean-René Vieillefond has published the fragments, with French translation and commentary (1970). Syncellus says (439. 18–20) that it was a work in nine books, dedicated to the emperor Alexander Severus, and containing information about medicine, nature, agriculture, and alchemy. Photius (*Bibl. cod.* 34) says that his copy of the *Kestoi* had fourteen books. Perhaps condensed versions of the work circulated, as well as the 24 books attested by the *Suda*. From one fragment (*Kestoi* 1. 20) we learn that Africanus was personally acquainted with the royal family of Edessa in Syria. In the papyrus fragment, Africanus states that he was thoroughly familiar with the library of the Pantheon in Rome, near the baths of Alexander, because he himself had built and furnished it for the emperor Alexander Severus. It was probably at the time of his embassy to Rome on behalf of Emmaus that Africanus became involved with the library (Granger 1933).

From the fragments of his other major work, the *Chronography*, we know of Africanus as the first Christian writer to have used a systematic numbering of the years since Adam, with a Christian era beginning in 5500 or, more likely, 5501. Photius (*Bibl. cod.* 34) describes what he calls the 'historical' work of Africanus as follows:

> It is concise, but omits nothing essential. It begins with the Mosaic cosmogony and continues to the coming (*parousia*) of Christ. It then epitomizes events from the time of Christ to the Roman emperor Macrinus, at which time, as he says, 'this book has its completion, including 5723 years'. The book is in five parts.

Martin Wallraff has recently (2007) published a new collection of the fragments, with English translation by William Adler. With a few exceptions, only Syncellus cites Africanus by name for years numbered from Adam.

Two of the exceptions appear in Syriac texts. Michael the Syrian (i. 42 Chabot), followed by Bar-Hebraeus (p. 49 Budge), cites Africanus for dating the Resurrection to the year 5532. In a passage where he calculates the Seleucid era according to various chroniclers, Bar-Hebraeus (p. 40 Budge) cites Andronicus and Africanus for an interval of 5083 years 'from Adam to Seleucus'. The Seleucid era corresponds to 312/11 BC (see Ch. 2). The interval of 5083 years requires a cosmic era of 5394 BC, which is inconsistent with the chronology of Africanus.

Bar-Hebraeus cites Andronicus several times, but nowhere else for an interval counted from Adam. He says (p. 49 Budge) that Andronicus dated the Passion to the year 342 of the Seleucid era (AD 30/1). Elias of Nisibis (p. 111 Chabot) says that Andronicus wrote a chronicle during the reign of Justinian. Otherwise, we know nothing about him or his work.

2. THE COSMIC YEARS 5500 AND 5723

Africanus is well known for having promulgated the idea that Christ was born in the middle of the sixth millennium from the creation. Syncellus (17. 31–18. 10) quotes from a text he labels as 'Africanus on the Mythical Chronology of the Egyptians and Chaldaeans'. Here Africanus says that the Jews, although they were descendants of the Chaldaeans through Abraham, received through Moses a more modest teaching about the antiquity of the world than that of the Chaldaeans. 'They have handed down', he says, 'a period of five thousand and five hundred years up to the appearance (*epiphania*) of the Saving Word.' Elsewhere (395. 19–22), Syncellus congratulates Africanus for having agreed with Hippolytus, Annianus, Maximus, and the whole apostolic tradition in dating the Incarnation to the year 5500. The *Paschale Campanum* (Mommsen 1892: 745), a Latin text composed about 600, also says that Africanus counted 5500 years from the first man to the Incarnation of the Lord.

The starting point for the determination of the absolute date to which the year 5500 corresponds is the synchronism between the year 5723 and the 250th Olympiad that appears in Syncellus' discussion of the establishment of the annual archonship at Athens. Here Syncellus (251. 24–9) cites Africanus for a chronological formula that seems to define the present year when Africanus was at work:

> The government of annual archons was initiated in the cosmic year 4804, when Creon ruled as the first archon in the 19th Olympiad. Some say the 25th Olympiad. From whom to the 250th Olympiad there were 903 archons until Philinus, when Gratus Sabinianus and Seleucus were the Roman consuls, there being 725 [correctly, 729] consuls from the time of Brutus after the kings to the cosmic year 5723 according to Africanus, which was the third year of the Roman emperor Antoninus Augentes [Elagabalus, 218–22].

Photius says that Africanus covered the period from creation to the reign of Macrinus in 5723 years. Syncellus says that Africanus synchronized the year 5723 with the third year of the emperor Elagabalus and with the 250th Olympiad, 221/2. According to Cassius Dio (79. 39–40) Elagabalus succeeded

Macrinus in June of 218. One way to reconcile Photius with Syncellus is to suppose that Africanus began his work during the brief reign of Macrinus (217–18), but that the present year when he finished the work was the third year of Elagabalus. Similarly, Syncellus says at the beginning of his work (2. 32, 6. 12) that the present year is 6300 and that he intends to cover the period from Adam to that year. Later (244. 31), he refers to the present year as 6302.

The synchronisms that Syncellus cites seem to yield an absolute date for the year 5723 as corresponding to some part of the year AD 221. Syncellus says Africanus counted 903 years from Creon to Philinus. The standard chronographic date for the archonship of Creon was the third year of the 24th Olympiad, 682/1 BC (Cadoux 1948: 88–90; see further below). If Philinus was numbered as 903 in a list that began with Creon as number 1 in Olympiad 24.3, then the archonship of Philinus corresponded, as Syncellus says, to the first year of the 250th Olympiad, 221/2.

Syncellus also cites Africanus as counting 725 consuls from Brutus to Gratus and Seleucus and the cosmic year 5723. Gratus and Seleucus appear in the consular lists at the year corresponding to AD 221. The numeral 725 in the manuscripts may be a scribal error. Counted from the archonship of Brutus and Collatinus as 1 at the standard date of 509 BC, the year of Gratus and Seleucus in AD 221 would be numbered as 730. Dionysius of Halicarnassus, however, says (*Antiquities* 5. 1) that Brutus and Collatinus were the first consuls after the expulsion of the kings and that they served for four months at the beginning of the 68th Olympiad. Thus the four months begin in September of the Roman year corresponding to 508 BC. If Africanus followed that system, then the first year of the 250th Olympiad would correspond to #729 in the Roman consular list. In Greek numerals, the handwritten symbols for 5 and 9 are easily confused.

According to Cassius Dio (79. 39–40), Elagabalus ruled for a little less than four years between June of 218 and March of 222. Elagabalus is listed in the Astronomical Canon with four years, beginning in the year 541 from Philip Arrhidaeus, 247 from Augustus (Mommsen 1898: 448). His first year is accordingly 217/18, and his third year 219/20. The Astronomical Canon backdated his first year from June of 218 to 1 Thoth = 29 August of 217. If Africanus postdated it from June of 218 to the beginning of the next Roman civil year in January of 219, then the third year of Elagabalus was 221.

All the intervals and synchronisms that Syncellus attributes to Africanus in this passage converge on the year corresponding to AD 221. If that was the year 5723, then the year 1 corresponded to 5502 BC. The year 5500 would be 3 BC, and the Christian era began in the year 5501, corresponding to 2 BC.

Denis Petau came to this conclusion (1630; *PG* 19. 1402–3), and his view has dominated scholarship since that time:

> If from 5723 years since Adam you take away 5500, there will remain 223 years from the Incarnation according to Africanus. The third year of Elagabalus is 221, in which year also the 250th Olympiad falls. Therefore Africanus predates the Dionysian era by two years and places the Incarnation of the Lord in the year 4712 of the Julian Period.

The year 4712 of Scaliger's Julian period corresponds to 2 BC (see Ch. 2). Other passages where Syncellus cites Africanus for a numbered cosmic year challenge Petau's conclusion. The most significant of them is the only fragment where Africanus deals directly with the chronology of Christ.

3. AFRICANUS ON THE PASSION

Under the title 'Africanus on the events surrounding the saving Passion and life-giving Resurrection', Syncellus quotes several excerpts from a longer text.

At the beginning of the first excerpt (391. 9–24), Africanus dismisses the idea that the darkness covering the earth at the time of the crucifixion can be explained as a solar eclipse. An eclipse of the sun can occur only at the time of a new moon. The Jews observe Passover on the fourteenth day of the moon, and Jesus was crucified on the day before Passover. Syncellus omits some material, then continues with an excerpt concerning the interpretation of the 'seventy weeks of years' prophesied in the Book of Daniel (9: 24). After indicating that he has omitted some more material, Syncellus concludes by quoting Africanus' chronological summary for the date of the Passion.

In his *Demonstration of the Gospel*, Eusebius preserves another version of the excerpt on the seventy weeks of years. Eusebius begins from a point in the text of Africanus before the place where Syncellus begins, and he ends well before Syncellus does. Jerome provides a Latin translation of the same excerpt in the ninth chapter of his *Commentary on Daniel.*

The relevant material is as follows: (i) text preserved by Eusebius and Jerome, just before the point where Syncellus starts; (ii) material that Eusebius, Jerome, and Syncellus have in common; (iii) text preserved by Syncellus after the point where Eusebius breaks off; (iv) a chronological summary, including the cosmic year, preserved only by Syncellus; and (v) Syncellus' own comment on the material. The translation from Eusebius is that of W. J. Ferrar (1920). Translations of Syncellus are adapted from that of

William Adler and Paul Tuffin (2002). Jerome preserves nothing different from Eusebius.

(i) Eusebius, *DE* 8. 2. 47–52; Jerome *Comm. Dan.* 9. It is clear, then, that the coming (*parousia*) of the Christ is foretold as to occur after seventy weeks. For in the time of our Saviour, or after His time, sins are done away and transgressions ended. And by this remission iniquities are blotted out by a propitiation together with unrighteousness, eternal righteousness is published beyond that of the law, visions and prophecies (last) until John, and the Holy of holies is anointed. For these things existed in expectation only before our Saviour's coming (*parousia*). The angel explains we must count the numbers, that is to say the seventy weeks, which are 490 years, from the going forth of the word of answer and from the building of Jerusalem. This took place in the 20th year of Artaxerxes, king of Persia. For Nehemiah his cup-bearer made the request, and received the answer that Jerusalem should be rebuilt, and the order went forth to carry it out. For till that date the city lay desolate. For when Cyrus after the seventieth year of the Captivity spontaneously allowed every one who wished to return, those with Joshua the High Priest and Zerubbabel went back, and those afterwards with Ezra, and were at first prevented from building the Temple, and the wall of the City, as no order had been given for it; and so there was a delay until Nehemiah and the reign of Artaxerxes and the 115th year of the Persian Empire. And this was 185 years from the taking of Jerusalem. It was then that King Artaxerxes gave the order for it to be built. And Nehemiah was sent to take charge of the work, and the street and wall were built, as it had been prophesied. And from that date to the coming of Christ is seventy weeks. For if we begin to count from any other point but this, not only the dates will not agree, but many absurdities arise. If, for instance, we begin counting the seventy weeks from Cyrus and the first Mission, the period will be too long by more than a century, if from the day the angel prophesied to Daniel still longer, and longer still if we start from the beginning of the Captivity. For we find the length of the Persian Empire to be 230 years, and of the Macedonian 300, and from then to the 16th year of Tiberius Caesar 60 years.

(ii) Syncellus 392. 1–14; Eusebius *DE.* 8. 2. 53; Jerome *Comm. Dan.* 9. From Artaxerxes to the time of Christ seventy weeks are completed according to Jewish reckoning. For from Nehemiah, who was sent by Artaxerxes to rebuild Jerusalem, in the 115th year of the Persian Empire, and in the 20th year of Artaxerxes, and in the 4th year of the 83rd Olympiad up to that date, which was the second year of the 202nd Olympiad, and the 16th year of the reign of Tiberius Caesar, there are 475 years, or 490 according to Hebrew reckoning. For they reckon years by the course of the moon, which is to put it roundly 29½ days, while the course of the sun is 365¼ days, and the twelve-month lunar cycle falls short by 11¼ days. Therefore the Greeks and the Jews add three intercalary months to every eighth year. For eight times 11¼ days makes three months. Therefore 475 years constitute 59 8-year cycles and three months. Since there are three intercalary months every eighth year, this adds up to 15 years. These added to the 475 years complete the seventy weeks.

(iii) Syncellus 392. 14–393. 3. Let no one think us ignorant of astronomical mathematics in having reckoned the year at 365¼ days. It is not from ignorance of the truth, but because of its complexity, that we have simplified the reckoning. For those who want to examine everything precisely, here is a brief explanation. Each year consists of 365 days, plus 5 parts of the 19 into which a day and a night can be divided. The difference between the year of 365¼ days and that of 365 plus five-nineteenths accumulates over the course of 475 years to 6¼ days. In the lunar month according to the precise calculation we find 29½ days plus 7½ of the 235 parts into which a day and a night can be divided, which is the equivalent of 3/94. These amount to a short time.

Therefore from the 20th year of Artaxerxes, according to the Hebrew Book of Ezra, which was the 4th year of the 80th [*sic*!] Olympiad according to the Greeks, until the 16th year of Tiberius Caesar, which was the 2nd year of the 202nd Olympiad, there are altogether the aforementioned 475 years, which are (as explained previously) 490 years according to the Hebrews, that is seventy weeks of years—the presence (*parousia*) of Christ as prophesied by Gabriel to Daniel.

There follows (393. 3–27) a long passage where Africanus defends his interpretation and explains also the 2300 'evenings and mornings' of desolation after the destruction of the temple that Daniel (8: 13–14) prophesies. These Africanus interprets as 2300 lunar months and 186 years, representing the interval from the fall of Jerusalem to the 20th year of Artaxerxes. Syncellus then concludes his excerpts with the chronological summary with which Africanus ended the whole discussion.

(iv) Syncellus 393. 28–30. Altogether, therefore, from Adam to the presence (*parousia*) of the Lord †and the Resurrection† there are 5531 years, from which time to the 250th Olympiad there are 192 years, as we have previously shown.

The phrase translated 'and the Resurrection' is not grammatically correct in the Greek text. Walraff (2007: xliii, 287) suspects it is a later gloss explaining Africanus' unusual use of the word *parousia* in reference to Jesus' public ministry.

Syncellus then quotes the notice on the Passion that appears at Olympiad 202.4 in the *Chronicle* of Eusebius (p. 174 Helm). To conclude the discussion, Syncellus comments on the fact that Africanus was right about the date of the Incarnation, but missed the correct date of the Passion by two years.

(v) Syncellus 394. 25–6, 395. 19–22. In asserting that it was 5531 and not 5533, Africanus commits an error of two years, according to the inerrant guide of the Gospels [Here Syncellus defends the long chronology for the life of Christ] . . . So Africanus, in conformity with apostolic tradition, reckoned the divine Incarnation in the year 5500, but he was in error by two years concerning the Passion and saving Resurrection, numbering this in the year 5531 of the Cosmos.

i. The Seventy Weeks of Years

Africanus interprets the seventy weeks of years as $70 \times 7 = 490$ Hebrew lunar years. Using the 8-year lunisolar cycle, he explains that 490 lunar years are equivalent to 475 solar years. That period, he says, consists of 59 full 8-year cycles, plus 'three months'. The 'three months' looks likes an error for 'three years'. For $59 \times 8 = 472$, leaving three years left over. Syncellus, Eusebius, and Jerome all attest to the reading 'three months', and we should resist the temptation to emend it. Africanus is here counting the number of lunar months that must be added in the course of 475 years. Three months are added every eight years, so in fifty-nine 8-year cycles, there are 177 intercalary months. Three months more must be added to bring the total to 180 months, the equivalent of 15 lunar years. Therefore, Africanus claims, 475 solar years contain 490 lunar years.

Syncellus continues with text that Eusebius and Jerome omit, in which Africanus informs the reader that he is aware of the inaccuracies in the 8-year cycle and that the lunar month is not exactly 29½ days nor the solar year exactly 365¼ days.

The true length of the solar year, he says, is 365 days plus $\frac{5}{19}$ of a day. That calculation is based on the 19-year lunisolar cycle, in which there are 6940 full days, rather than 6939 ¾ days. The average length of a year is therefore $6940/19 = 365 + \frac{5}{19}$.

Africanus calculates the average length of a lunar month as being 29½ days plus $\frac{3}{94}$ of a day. The numerals in this portion of the text are corrupt. The text reads literally, 'day and night being divided into 205 parts; of these seventy and a half, which are three ninety-fourths'. Eduard Schwartz correctly inferred the readings '235' and 'seven and a half'.[2]

The calculation is based on the 235 lunar months in a 19-year cycle. There is a difference of 7½ days between $235 \times 29.5 = 6932.5$ and the total of 6940 days in the 19-year cycle. Therefore, 7.5/235 days must be added to each lunar month. Reduced to simplest terms, that fraction can be expressed as $\frac{3}{94}$.

The point of the passage is that the difference between the approximate values based on the 8-year cycle and the more accurate values of the 19-year cycle are not so great as to vitiate the equivalence between 490 lunar years and 475 solar years.

[2] Schwartz 1895: 26; adopted by Adler and Tuffin 2002: 468.

Africanus finds that the 475 years represent the interval between the fourth year of the 83rd Olympiad and the second year of the 202nd Olympiad. The count begins from the 20th year of Artaxerxes, when Nehemiah (Neh. 2: 1–5) set forth to rebuild Jerusalem. The prophecy was fulfilled in the 475th year, Olympiad 202.2, the year of the Passion and Resurrection.

ii. The Years 5531 and 5532

In this set of excerpts, only Syncellus quotes Africanus for a count of the years elapsed from Adam to the Passion, citing that interval as 5531. An anonymous commentary on the *Hexaemeron* (the six days of creation) includes what seems to be another witness to this same chronological summary and confirms the number 5531. Leone Allacci first published the text (1629), wrongly attributing it to Eustathius of Antioch (*c.*AD 325):[3]

> From Adam to the death of Phalek there are three thousand years and to the presence (*parousia*) and the Resurrection of the Lord there are five thousand five hundred and thirty-one, leaving four hundred and fifty-nine [correctly 469] years in the sixth millennium.

Here and throughout the following discussion, I transliterate the Greek form of Hebrew names—thus 'Phalek' rather than 'Peleg'.

The passage does not cite Africanus, but the author elsewhere (*PG* 18. 708) names him as among his sources. Syncellus (97. 11) cites Africanus explicitly for this same count of 3000 years from Adam to the death of Phalek. If the phrase 'and the Resurrection' was originally a gloss, then the author had a text similar to that used by Syncellus.

In the chronological summary, Africanus counts 5531 years to the *parousia* and 192 years from there to the 250th Olympiad. The interval of 192 leads to 5723, the same year that Africanus synchronizes with the 250th Olympiad in the discussion of the Athenian archonship. Yet, in the main body of this fragment, Africanus says that the seventy weeks of years are completed at the *parousia* of Christ in the 16th year of Tiberius and the second year of the 202nd Olympiad. From Olympiad 202.2 to Olympiad 250.1, there are 191 years, not 192. Bar-Hebraeus (p. 49 Budge) and Michael the Syrian (i. 42 Chabot) both say the year of the Passion according to Africanus was 5532. That number produces the interval of 191 years between the two cosmic years, consistent with the interval between the two Olympiad dates.

[3] Reprinted *PG* 18. 707–94; the quoted text is at *PG* 18. 757.

Another problem arises from the coordination of Olympiad dates with regnal years. Olympiad 202.2 corresponds to AD 30/1. The 16th year of Tiberius corresponds to 29/30, if counted from his accession in August of 14, or to AD 30, if counted from the beginning of the next Roman civil year.

Scholars have debated whether Africanus dated the Passion to the second year of the 202nd Olympiad, 30/1, or to the 16th year of Tiberius, corresponding to 29/30.

iii. The Argument for AD 30

Some have argued that Africanus, following the shorter chronology for the career of Jesus, must have dated the Passion to the 16th year of Tiberius in AD 30. Baptized in the 15th year of Tiberius and going up to Jerusalem for the Passover only once, Jesus was crucified in the 16th year.

Petau (1630, *PG* 19. 1403–4) believed that Africanus reckoned his cosmic years from a date for creation in March or April. Petau did not know the Syriac texts, but he anticipated their evidence by arguing that the Passion took place at the end of the year 5531, the beginning of 5532, in April AD 30. It is by 'prolepsis', he suggests, that Africanus calls this date the second year of Olympiad 202. Petau thus brings this passage into agreement with the synchronism between the cosmic year 5723 and the consulship of Seleucus and Gratus. If the year 5532 began in April of AD 30, then the year 5723 began in April of 221, anticipating by the same prolepsis the actual observance of the 250th Olympiad. By this chronology, the Incarnation took place at the end of 5500 and the beginning of 5501, in March or April of the year corresponding to 2 BC.

Jack Finegan (1964: 140–7; 1998: 154–8) has also argued for AD 30 as the date of Africanus for the Passion. Finegan assumed that Africanus synchronized his cosmic years with the Olympiad year. He reconstructed the chronology of Africanus such that the year 5500 from Adam corresponds to Olympiad 194.2 = 3/2 BC. He takes the 16th year of Tiberius in the fragment 'On the Passion' as the central datum. Accepting the synchronism between 5723 and Olympiad 250.1, Finegan synchronizes 5531 with Olympiad 202.1 as being the date of Africanus for the Passion in April of the year 30. He does not explain why the texts express the date as Olympiad 202.2.

iv. The 16th Year of Tiberius and Olympiad 202.2

Richard Burgess (2006) has suggested a solution that reconciles a date for the 16th year of Tiberius in 29/30 with the second year of the 202nd Olympiad. Burgess claims that Olympiads are always synchronized to the calendar year of whoever is doing the calculations. Someone from the eastern Empire using a version of the Macedonian calendar, with its new year in the autumn, would employ an Olympiad chronology that started in the autumn of 777 BC, since the Olympiads began in that calendar year. Thus the 202nd Olympiad was observed in the summer of 29, during the Macedonian year that began in October 28. Olympiad 202.2 began in October of 29, synchronized with the 16th year of Tiberius. Similarly, the first year of the 250th Olympiad began in October 220, although the actual festival would not be observed until the summer of 221. The year 220/1 is the correct third year of Elagabalus, according to Cassius Dio.

There are problems with this hypothesis. First, if the year 5723 began in October 220 and counted as Olympiad 250.1, then the year that began in October 29 and counted as Olympiad 202.2, must have been numbered as 5532, as Burgess states. The interval from that point to the year 5723 is 191 years, not 192. Burgess suggests that here and elsewhere Africanus counted Olympiad years inclusively, beginning with Olympiad 202.2 as year 1, concluding with Olympiad 250 as year 192. Yet Syncellus does not cite Africanus for an interval of 192 years from Olympiad 202.2 to Olympiad 250, but for an interval of 192 years from Adam's year 5531 to the 250th Olympiad. The coordination of the year 5723 with the 250th Olympiad requires that the 192 years be an interval, not an inclusive count.

Second, Syncellus elsewhere (373. 26–9) cites Africanus as dating the last year of Cleopatra to the year 5472 from Adam. If 5532 corresponded to 29/30, then 5472 was 32/1 BC. The correct date for the last year of Cleopatra, according to the Astronomical Canon, is 31/0 BC (Mommsen 1898: 448). It is possible, but unlikely, that Africanus had the date wrong.

Furthermore, the hypothesis that chronographers of eastern origin would have counted their Olympiad years from an epoch corresponding to September or October of 777 BC lacks a firm foundation in the evidence. G. F. Unger made this claim in an essay on Greek and Roman chronology published in an influential handbook (1886: 64), and he argued the case more fully in an article on Seleucid chronology (1895: 310–13). He cited Ephorus, Castor of Rhodes, Phlegon, Julius Africanus, and Porphyry as examples. Eduard Meyer (1899: 447) endorsed the argument, as did Friedrich Ginzel (1906–14: ii. 358).

In 1930, Felix Jacoby, in his commentary on the fragments of Porphyry (*FGrHist* 260) pronounced such an Olympiad reckoning as unthinkable for any ancient chronographer. Nevertheless, E. J. Bickerman (1968: 76) repeated the claim, citing Unger and Meyer. Relying in part on Bickerman for precedents, Burgess (1998: 28–35) argued that Eusebius used such a system in his chronicle.

Unger's claims rest on a distortion of the evidence. He points out (1895: 300–13) that Eusebius (p. 89 Karst) cites Porphyry for an interval of 407 years from the fall of Troy to the first Olympiad, whereas for Eratosthenes that interval was 408 years. Similarly, Eusebius (p. 85 Karst) attributes to Castor an interval of 267 years from the Ionian migration to the first Olympiad, whereas for Eratosthenes the interval was 268 years.

It is true that 408 is the correct interval between the fall of Troy and the first Olympiad in the system of Eratosthenes. It is not true, however, that Eratosthenes counted that interval as 408 years. Our knowledge of the genuine intervals used by Eratosthenes comes from a fragment quoted by Clement of Alexandria (*Stromata* 1. 21. 138). Clement cites Eratosthenes for an interval of 80 years to the return of the Heraclids, 60 to the Ionian migration, 159 to Lycurgus, 108 to the year before the first Olympiad, 297 to the expedition of Xerxes, and from there to the beginning of the Peloponnesian War 48 years.

The total of these intervals from the fall of Troy to the year before the first Olympiad is 407 years and from there to the Peloponnesian War 345 years. Thucydides (2. 2) says the Peloponnesian War began in the springtime, two months before the end of the archonship of Pythodorus, and (2. 28) that there was an eclipse of the sun the following summer. Astronomical calculations produce an annular eclipse in central Greece on 3 August 431 BC.[4] It follows that the archonship of Pythodorus was 432/1 and that Eratosthenes' epoch of the first Olympiad 345 years earlier was 777/6.

Eratosthenes designates this epoch as 'the antecedent year of the first Olympics'. Dionysius of Halicarnassus says (*Antiquities* 1. 74) that Eratosthenes counted 432 years from the fall of Troy to the first year of the 7th Olympiad. The interval to the first year of the first Olympiad was therefore 408 years. Thus, Eratosthenes dated the first year of the first Olympiad to 776/5 BC, but he made the preceding year 777/6 his epoch for the counting of intervals, 407 years after the fall of Troy and 345 years before the Peloponnesian war (see Ch. 2).

What Eusebius quotes from Castor and Porphyry is an abbreviated version of the genuine intervals of Eratosthenes, not a date for the beginning of the first year of the first Olympiad in the fall of 777 BC.

The work of Ephorus has not survived, but it was among the sources of Diodorus Siculus. Unger's claim that Ephorus used the Macedonian year derives from a passage where Diodorus (11. 27) narrates under the year corresponding to Olympiad 75.2 a series of events following upon the battle of Salamis. The first of those events belongs to the fall of 480 BC, and the last

[4] Espenak and Meeus 2006: #03764.

to the summer of 479. Unger (1881: 60–1) fixes upon the earliest of those events and concludes that Ephorus must have dated it to the Macedonian year beginning in October of 480. What Diodorus proceeds to narrate under Olympiad 75.2, however, are the events of the summer of 479. It is likely that Ephorus narrated those events under the Athenian year corresponding to 479/8, which was Olympiad 75.2 in the later chronographic system.

In a separately published paper on the chronology of Africanus, I have demonstrated (2006: 92–102) that Castor, Phlegon, and Porphyry all used a standard Olympiad with an epoch corresponding to summer 776 BC. That Africanus used a standard Olympiad follows especially from his synchronism between the 250th Olympiad and the archonship of Philinus, numbered as the 903rd in the list.

In classical times, the Athenian year began in the summer, shortly before the observance of an Olympiad. Eratosthenes and other earlier chronographers synchronized Olympiad years with archon-years.[5] Gustav Hirschfeld (1873: 57–8) argued from epigraphic evidence that the Athenian civil year was changed during the reign of Hadrian from the month of Hecatombaeon (June/July) to the month of Boedremion (September). His conclusion has been widely accepted.[6] In that case an Olympic observance would have taken place at the end of an archon's year, rather than the beginning. On the basis of the synchronism with the consulship of Seleucus and Gratus and with the 250th Olympiad, some scholars have concluded that the year of Philinus must have been 220/1.[7] Yet the change in the civil year would not have affected the numbering of the archons in the list or the coordination of archon-years with Olympiads.

When Africanus synchronized the 250th Olympiad with the archonship of Philinus as the 903rd from Creon, he can have meant only the archon-year corresponding to 221/2. If he meant that there is an interval of 903 years from Creon to Philinus, then the archonship of Philinus was 222/3. The fragment cannot be construed to make the archonship of Philinus correspond to 220/1, unless we are prepared to move the archonship of Creon from 682/1 to 683/2.

Many scholars do indeed conclude from the evidence of the Parian Marble that the archonship of Creon was 683/2.[8] The interval from that entry to the author's own time is 420 years. The chronicle was therefore inscribed about 263, before Eratosthenes established what became the standard system for coordinating Olympiads with archon's years. Whether the interval of 420

[5] For examples, see Mosshammer 2006.
[6] Ginzel 1906–14: ii. 349–350; Graindor 1934: 14–19.
[7] Notopoulos 1949: 38; Kapetanopoulos 1990.
[8] Samuel 1972: 198; Sickinger 1999: 47–51; see Ch. 2.

years in the Parian Marble accurately reflects the author's Athenian sources we do not know.

That Eratosthenes' date for the archonship of Creon corresponded to 682/1 BC can be inferred from Dionysius of Halicarnassus and Castor of Rhodes. Dionysius states (*Antiquities* 1. 71) that the first year of Charops corresponded to Olympiad 7.1, 752/1. Charops was the first of the seven 10-year archons who preceded Creon as the first of the annual archons. If the first year of Charops was Olympiad 7.1, then the year of Creon 70 years later was Olympiad 24.3, 682/1. Dionysius was an expert on Greek chronography. He wrote a now lost work 'On Chronology' to which he refers the reader (*Antiquities* 1. 74) for detailed information about the chronological system of Eratosthenes and how that system should be coordinated with Roman chronology.

Castor of Rhodes, working about fifty years earlier than Dionysius, wrote an Olympiad chronography that coordinated the Olympiads with lists of Greek, Roman, and Near Eastern kings and officials. Eusebius cites the work in the first book of his chronicle for a synchronism between the second year of Aeschylus and the first Olympiad. The Armenian text (p. 88 Karst) reads '12th year', which is a scribal error. In the chronological canons (p. 86 Helm) there is a note that the first Olympiad was observed in the second year of Aeschylus.

Aeschylus was the next to the last of the life-long archons. Castor says he served for 23 years, was followed by Alcmaeon for two years, after which the first of the decennial archons entered upon the office. A synchronism between the first Olympiad in 776 BC and the second year of Aeschylus is consistent with the statement of Dionysius of Halicarnassus that the first year of Charops corresponded to Olympiad 7.1, 752/1.

Whatever may have been the true historical date for the beginning of the annual archonship, and whatever the date that the author of the Parian Marble knew, the standard chronographic date for the archonship of Creon was 682/1.

The thesis that every chronicler must reduce all dates to a single system synchronized with his own calendar year is not self-evidently true. Burgess's argument for Eusebius is based primarily on the dates for the Roman emperors in the anonymous list of Olympic victors that Eusebius preserves in the first book of his chronicle and the similar dates that he enters in the chronological canons of the second book. Again, Unger had offered much the same argument.

To engage this issue comprehensively would require too long a digression. A few examples will suffice. Caligula became emperor on 16 March 37.[9] The list

[9] Suetonius, *Tiberius* 73. 1; *Gaius* 58–9.

of Olympic victors notes his accession at Olympiad 204, and Eusebius coordinates his first year with Olympiad 204.1. Since the 204th Olympiad was observed in the summer of the year 37, the chronographic year 204.1 must have begun, according to Unger (1895: 312) the previous autumn. Claudius was proclaimed emperor within a couple of days after the death of Caligula on 24 January 41.[10] Eusebius enters his first year at Olympiad 105.1, but the 105th Olympiad was not observed until summer 41. Domitian was assassinated on 18 September 96.[11] Nerva became emperor shortly thereafter. Eusebius has his first year at Olympiad 119.1, but the 119th Olympiad was not observed until summer 97.

These and similar examples can be accommodated on the hypothesis that Eusebius distinguished between Olympiad years and Roman years and coordinated them such that an Olympiad year began during the summer of the Roman year with which it was aligned. Eusebius antedated the chronographic first year of Caligula to the previous January and postdated that of Nerva to the following January. It is not necessary to postulate, with Burgess (1998: 30), that Eusebius must always have intended to include the actual date of accession within the chronographic first year.

Eusebius notes the first year of the era of Antioch at Olympiad 188.1 synchronized with the first year of Julius Caesar. The 188th Olympiad was observed in summer 48 BC. The era of Antioch actually began in autumn 49 (see Ch. 2). Therefore Unger (1895: 315) claims that Eusebius' Olympic epoch must correspond to 777/6 BC.

Here again the data are explicable on the hypothesis that Eusebius dated the first year of Caesar to the Roman year 48 BC, within which the 188th Olympiad was observed. The Antiochenes counted their era from the first year of Julius Caesar, as Eusebius' entry states. That the Antiochenes backdated Caesar's first year to the autumn of 49 does not imply that Eusebius must also have done so.

Eusebius has the first year of Constantine aligned with Olympiad 271.3. A standard Olympiad 271.3 would correspond to 307/8. Constantine was proclaimed emperor by his troops on 25 July 306, and he counted his rule from that date.[12] Eusebius postdated the first chronographic year of Constantine to the Roman year that began in January 307. It was during the summer of that Roman year that Olympiad 271.3 began.

Dionysius of Halicarnassus clearly distinguished between Roman years and Olympiad years. He coordinated them in the same way that I am here

[10] Suetonius, *Gaius* 58. 1, *Claudius* 10.
[11] Suetonius, *Domitian* 17. 3.
[12] Socrates, *HE* 1. 1; *Consularia Constantinopolitana*, Mommsen 1892: 231.

postulating for Eusebius. Dionysius says (5. 1) that Brutus and Collatinus were the first consuls after the expulsion of the kings and that they served for four months at the beginning of the 68th Olympiad. Thus the four months begin in September of the Roman year corresponding to 508 BC, shortly after the 68th Olympiad was observed. As he proceeds through the narrative, Dionysius names the Roman consuls and the Athenian archon for each year, adding the numbered Olympiad every four years.

Dionysius says (5. 37) that in the fifth year from the expulsion of the kings, it was the 69th Olympiad, when Acestorides was archon at Athens, and Marcus Valerius and Publius Postumius were consuls. If Brutus and Collatinus belong to the year 508 BC, then the fifth year was 504. The 68th Olympiad was observed in the summer of that year. Four years later he says (5. 50), 'In the 70th Olympiad, when Smyros was archon at Athens, Postumius Cominius and Titus Larcius succeed to the consular office.' The consular year now is 500 BC. The 70th Olympiad was celebrated in the summer of that year. Dionysius is coordinating the consular year with the numbered Olympiad that began in that year. It is not the case (as some translations would have it) that Postumius Cominius and Titus Larcius took office during the 70th Olympiad, but that the 70th Olympiad was observed during their term of office.

Later in the narrative (10. 53) we read, 'In the eighty-second Olympiad—when Lycus of Larissa in Thessaly won the foot-race—Chaerephanes being archon at Athens, three hundred years having been completed since the founding of Rome, Publius Horatius and Sextus Quintilius succeeding to the consulship, a great plague fell upon Rome'. The 82nd Olympiad was observed in the summer of 452 BC. In his preface (1. 3) Dionysius says there are 745 years from the founding of Rome to the consulship of Claudius Nero II and Calpurnius Piso, who were elected during the 193rd Olympiad. The 193rd Olympiad was observed in 8 BC. Claudius Nero II and Calpurnius Piso appear in the consular lists at 7 BC. Therefore the 193rd Olympiad corresponds to the consular year 8 BC and the year 745 of Rome. At the interval of 444 years earlier, the 82nd Olympiad corresponds to 452 BC, the year 301 of Rome, and the consulship of Publius Horatius and Sextus Quintilius. Again Dionysius coordinates the Olympiad with the Roman year within which it began. Dionysius treats the consular year as beginning in January, although that was not regularly the case until 153 BC (see Ch. 2).

As we shall see, Africanus could and did distinguish among an Olympiad year beginning in the summer, a Roman year beginning in January, and a cosmic year beginning in March—coordinating Roman years with Olympiad years in the same way as Dionysius of Halicarnassus. The 16th year of Tiberius was the Roman year AD 30, within which the second year of the 202nd Olympiad began.

v. The Argument for AD 31

Gelzer (1898: i. 33, 45, 48–50) argued that Africanus used the standard Olympic epoch corresponding to 776 BC and that his date for the Passion in Olympiad 202.2 therefore corresponded to AD 31. Gelzer explained the variation in the evidence between the cosmic years 5531 and 5532 as deriving from the use of different calendars. Africanus expressed dates by reference to numbered Olympiads beginning in the summer, but synchronized his years from Adam with the Roman civil year beginning the following January. Thus the second year of the 202nd Olympiad, 30/1, included the last six months of the cosmic year 5531 and the first six months of the year 5532. Eusebius quotes Africanus as giving an interval of 60 years from the fall of Alexandria to the 16th year of Tiberius. Syncellus (373. 26–9) cites Africanus as dating the fall of Alexandria to 5472. The interval of 60 years yields 5532 for the 16th year of Tiberius and the date of the Passion. Thus Africanus dated the reign of Tiberius one year too late. From this conclusion that the year 5532 began in January of AD 31, Gelzer infers that the year 5500 began in January 2 BC. Africanus dated the Incarnation, Gelzer says, to the year 5500 and the Nativity to the turn of the year 5500/1, corresponding to 2/1 BC. Gelzer does not seem to notice that this conclusion yields a year 1 corresponding to 5501 BC, not 5502 as he had stated (1898: i. 40) a few pages earlier.

Schwartz (1895: 22–38) found it unthinkable that Africanus could have made a mistake either in the regnal years of Tiberius or in an Olympiad date. Accepting the Syriac evidence, Schwartz agreed with Gelzer that Africanus dated the Passion to 5532 = AD 31. Schwartz disagreed that Africanus used the Roman civil year as the basis for his chronological system. He argued that Africanus synchronized his cosmic years with his Olympiad years and both in turn with the Macedonian calendar of Syria. For Schwartz, those years began on 1 October following the anniversary of the Olympic observance—not, as Unger maintained, on the previous 1 October. Schwartz reconstructed the system of Africanus such that the Incarnation is to be dated to the cosmic year 5500 = Olympiad 194.2 = 3/2 BC, and the Passion to the cosmic year 5532 = Olympiad 202.2 = AD 30/1, the 17th year of Tiberius. Schwartz suggested that Africanus sought to effect a compromise between the short chronology of the synoptic gospels, which implies a date for the crucifixion in the 16th year of Tiberius, and the long chronology of the fourth Gospel, in which the crucifixion would be in the 18th year of Tiberius.

Richard (1951: 23–5) also accepted 5532 as the correct cosmic year of Africanus' date for the Passion, corresponding to Olympiad 202.2, AD 31. He would correct the numeral in the text of Syncellus to read 5532 and the interval to read 191 years from that date to the 250th Olympiad. In order to bring the sixteenth year of Tiberius into Olympiad 202.2, Richard argues, Africanus reckoned 44 years for the rule of Augustus in Alexandria, instead of the canonical 43. According to Richard, Africanus dated the Incarnation and the Nativity to 5500, 2 BC.

Grumel (1958: 22–4) accepted Gelzer's conclusion that Africanus dated the Passion to the year 5532 from Adam, corresponding to AD 31, the second year of the 202nd Olympiad. Grumel offered some additional arguments in favour of that date. First, he pointed out that Syncellus (391. 11) quotes from Africanus for the statement that Jesus was crucified on the day before Passover. In the year 31, according to the later Alexandrian calculations, 23 March was a Friday and the 13th day of the moon. Second, Grumel correctly noted that if AD 31 corresponded to the cosmic year 5532, then the year 1 corresponded to 5501 BC. In that year the likely date for creation was Sunday, 22 March. In Grumel's view, that was precisely the date of the vernal equinox in Alexandrian astronomy of that period. Like Petau, Grumel argued that as a Christian chronicler establishing an era of creation, Africanus would have numbered his cosmic years from the anniversary of creation at the time of the vernal equinox. Grumel also agreed with Petau, although without citing him, that Africanus would have dated the Incarnation and the first year of the Christian era to 5501, not 5500. Therefore Africanus' date for the Incarnation was March 1 BC.

vi. Olympiad 202.2 and the Fulfilment of the 70 Weeks of Years

It is not necessary to choose between the historically correct date of the 16th year of Tiberius in 29/30 and the chronographically correct date of Olympiad 202.2 as corresponding to 30/1. Nor need we choose between the Greek testimony counting 5531 years from Adam to the Resurrection and the Syriac evidence that Africanus dated that event to 5532. Much of the scholarly confusion about this passage arises from connecting two sets of data in a way that Africanus did not. In commenting on the excerpts, Syncellus twice (394. 25, 395. 21) says that Africanus was wrong to date the Passion and Resurrection to the year 5531, instead of the turn of the year 5533/4. Nowhere in the excerpts, however, does Syncellus actually quote Africanus as having dated the Resurrection to the year 5531 from Adam.

There are two separate dating formulae in these excerpts. The first is the calculation of an interval of 490 lunar years, 475 solar years, as separating the 16th year of Tiberius and Olympiad 202.2 from the 20th year of Artaxerxes and Olympiad 83.4. This period begins from Olympiad 83.4 counted as 1 and ends with Olympiad 202.2 counted as 475. There is no cosmic year associated with this count.

The second formula appears in the chronological summary that only Syncellus quotes—'From Adam to the *parousia* there are 5531 years, from which time to the 250th Olympiad there are 192 years.' Neither the 16th year of Tiberius nor Olympiad 202.2 is associated with the cosmic year 5531.

The Syriac witnesses state that Africanus dated the Resurrection to the year 5532, but they mention neither a regnal year nor an Olympiad.

The coordination of the year 5723 with the 250th Olympiad requires that Olympiad 202.2 should include some portion of the year 5532. Since the 250th Olympiad was observed in AD 221, the year 1 must correspond in some way to 5502/1 BC. It is most likely, as Petau and Grumel maintained, that Africanus numbered the years of Adam from a date for creation in the springtime—not, as Finegan and Schwartz would have it, from a date in the late summer or early autumn in synchronism with the Olympic year. In addition to the argument that Adam's year 1 should have begun at creation, we may note that Africanus summarized the history of the Israelites from the time of the Exodus down to the period of the kings. That history began with the Passover in the month of Nisan, and Africanus would have numbered the years of Moses, Joshua, the judges, and the kings from that time.

If Africanus used the standard chronographic Olympiad year, with Olympiad 250.1 corresponding to 221/2 and some portion of the year 5723, then the year 1 corresponded to some portion of the year 5502/1 BC. The date for creation would have been in the springtime of 5501 BC, near the vernal equinox. The cosmic year 5723 must therefore have begun during the first year of the 250th Olympiad, but in AD 222.

This conclusion breaks the link between the year 5723 and the Roman year that corresponded to the third year of Elagabalus and the consulship of Seleucus and Gratus. The central datum in this passage is, however, not the consulship of Seleucus and Gratus, but the archonship of Philinus, synchronized with the 250th Olympiad. It is the 250th Olympiad, not the year 221, that links all the data. The archonship of Philinus and the 250th Olympiad began during the consulship of Seleucus and Gratus in 221, and the year 5723 from Adam began during the 250th Olympiad, in 222.

If Africanus synchronized Roman imperial years with the Roman civil year beginning in January, then the 16th year of Tiberius is congruent with Olympiad 202.2 in the same way that the third year of Elagabalus and the consulship of Seleucus and Gratus are congruent with Olympiad 250.1. The 16th year of Tiberius, AD 30, is the Roman calendar year within which Olympiad 202.2 began, AD 30/1. Similarly, the third year of Elagabalus and the consulship of Seleucus and Gratus, AD 221, designate the Roman year within which the 250th Olympiad was observed.

Africanus counted the seventy weeks of years as 475 solar years, beginning from Olympiad 83.4, and ending in Olympiad 202.2, the 16th year of Tiberius. The actual date of the Resurrection occurred within that 475th year and within the second year of the 202nd Olympiad, although it was now by the springtime of the year 31, the 17th year of Tiberius.

There is a similar disjunction at the other end of the interval. Eusebius, Syncellus, and Jerome all quote Africanus as stating that Artaxerxes sent Nehemiah to rebuild Jerusalem in the 115th year of the Persian Empire, the 20th year of Artaxerxes, and the 4th year of the 83rd Olympiad. Africanus then counts the 475 solar years from Olympiad 83.4. Yet Eusebius (*PE* 10. 10. 10) and Syncellus (71. 12) also quote Africanus as dating the first year of Cyrus to the 55th Olympiad, and in the version of Eusebius it is clear that it was the first year of that Olympiad. Counted from Olympiad 55.1, the 115th year of Persian rule and the 20th of Artaxerxes should be Olympiad 83.3, not 83.4.

The reason for this discrepancy is that Africanus had also to account for the '2300 evenings and mornings' of desolation that Daniel (8. 14) had prophesied. He interprets them as the equivalent of 2300 lunar months and 186 solar years. Syncellus quotes Africanus (393. 13–19) as saying that 185 years are completed in the 20th year of Artaxerxes and that in the 186th year Nehemiah built the walls for the city. That is, there are 70 years of captivity plus 115 years of Persian rule, so that the 20th year of Artaxerxes represents the 185th year and Olympiad 83.3. Africanus needs 186 years to fill his 2300 lunar months. It is therefore in the 186th year and Olympiad 83.4 that the city was rebuilt.

Africanus could find justification for this approach in the Biblical book known as Nehemiah in English Bibles. In the Septuagint Greek Bible, a version of which Africanus used, the books of Ezra and Nehemiah are a single book designated as 2 Esdras. In the Latin Bible, they are separated into two books designated as 1 and 2 Esdras; 1 Esdras of the Greek Bible is 3 Esdras in the Latin Bible. That book is included among the Apocrypha in the Authorized (King James) Version and later English Bibles, but with the original Greek title 1 Esdras. The apocalypse attributed to Ezra as his 'second book' (1: 1) is not in the Greek Bible, but survives in Latin, Syriac, and several other languages. It is included in the Latin Bible as 4 Esdras and becomes 2 Esdras in the English collection of the Apocrypha. Here and elsewhere I cite by the versification of the books of Ezra and Nehemiah in the Revised Standard Version.

The narrative states (Neh. 2. 1–5) that Nehemiah received permission from the king to go to Judah in the month of Nisan in the 20th year of Artaxerxes. The wall was completed on the 25th day of the sixth month, the month of Elul, after 52 days of work (6. 15). When the seventh month had come (7. 73–8. 8), the people came in to Jerusalem to dedicate the new city and to hear Ezra read the Law. Finally, on the 24th day of the seventh month (9. 1), they ratified a new covenant.

From this narrative, Africanus concluded that Nehemiah went to Jerusalem and began the work in the 20th year of Artaxerxes and the third year of the 83rd Olympiad. By the time the work was completed, however, and the people gathered for the reading of the Law, it was the month of September and the fourth year of the 83rd Olympiad had begun.

Africanus synchronized the first year of Cyrus with the 55th Olympiad. If he synchronized the 20th year of Artaxerxes with Olympiad 83.3, then the 21st year had actually begun by the time the work was completed in the sixth month of the Hebrew year and the first month of the Olympiad year. Following the Book of Nehemiah, Africanus reckoned the Hebrew year as beginning from the month of Nisan in Olympiad 83.3. Olympiad 83.4 began in the sixth month.

Similarly, the 475th year from Olympiad 83.4 began during the sixteenth year of Tiberius, but it was not until the turn of the next cosmic year that the prophecy received its full confirmation in the Passion and Resurrection. The first year of Cyrus and the 20th year of Artaxerxes are scriptural, as is the 15th year of Tiberius as a date for the baptism of Jesus. The shorter chronology of the synoptic gospels implies a date for the crucifixion in or shortly after the 16th year of Tiberius. The coordination of regnal chronologies with Biblical prophecies is a tricky business. The 2300 evenings and mornings must be made to intersect with 70 weeks of years in such as a way as to fill the interval between the first year of Cyrus and the 16th year of Tiberius without distortion of the received chronology. Africanus needed only to adjust the 29 years of rule that Herodotus (1. 214) reported for Cyrus to 30 years to make the intervals work.

That Africanus counted 5531 years from Adam to the *parousia*, but dated the Resurrection to 5532 entails no contradiction. As I shall explain further below, in the chronological summaries that Syncellus quotes, Africanus sometimes numbers the year from Adam when an event occurs, and sometimes expresses the interval from one epoch to another. It is not clear from the quotation whether Africanus meant to say that 5531 is the year of the *parousia* or that there is an interval of 5531 from Adam to the *parousia*, in which case the *parousia* belongs to 5532. Wallraff (2007: 287) suggests that the *parousia* might refer to the beginning of Jesus' public ministry. On either interpretation the count of 5531 years from Adam to the *parousia* implies 5532 for the Resurrection. If Africanus counted his cosmic years from 25 March and dated the Resurrection to 25 March of AD 31, then it is literally the case that Christ went to the Passion at the end of 5531 and rose from the dead at the beginning of 5532.

The case for Olympiad 202.2 = AD 31 = Adam's year 5532 as Africanus' date for the Resurrection is strong. The archonship of Philinus anchors the conclusion on one side, the last year of Cleopatra on the other. The archonship of Philinus can only have been 221/2. Africanus synchronized the archonship of Philinus with the 250th Olympiad. The 250th Olympiad therefore corresponded to 221/2, and Olympiad 202.2 to 30/1. Africanus also associated the cosmic year 5723 with the archonship of Philinus. If 5723 belongs to the 250th Olympiad, then 5532 belongs to Olympiad 202.2. Sixty years earlier, the cosmic year 5472 was included within the second year of the 187th Olympiad, 31/0 BC, which is the correct date for the last year of Cleopatra.

Only one correction to the text is necessary. The text of Syncellus synchronizes 5472 with the 4th year of the 187th Olympiad. The '4th' year must be a scribal error. The coordination of 5472 with Olympiad 187.4 would require that the year 5723 be aligned with the third year of the 250th Olympiad, instead of the first. Gelzer (1898: i. 46), following Conrad Trieber (1880: 66), proposed emending the Olympiad date to 187.3. That solution is unsatisfactory. It would require synchronizing the year 5723 with the second year of the 250th Olympiad. Furthermore, Olympiad 187.3 = 32/1 BC is not the correct date for the last year of Cleopatra.

A more credible emendation would be Olympiad 187.2. That year, corresponding to 31/0 BC, is the correct date for the last year of Cleopatra according to the Astronomical Canon. A mistaken reading of Olympiad 187.4 instead of 187.2 can be explained paleographically. The first letter of the Greek word for second is delta, but in numerals delta stands for 4. Thus, a copyist could have converted the word *deutero* (the second) to δ (the 4th), instead of β (the 2nd).

vii. 25 March AD 31

Although none of our witnesses cites Africanus for the calendar date, it is likely to have been 25 March. In the Roman church, 25 March was the date of the Passion, on a Friday in the year corresponding to AD 29—a date attested as early as Tertullian (*Adversus Iudaeos* 8). Sunday, 25 March AD 31, was the traditional date for the Resurrection in the Greek church, ultimately prevailing over Annianus' date of 25 March AD 42. The author of the *Chronicon Paschale* (408. 16–21) asserted that date, Bar-Hebraeus cites Andronicus for a date corresponding to 31, and Cedrenus (i. 334. 3, 344. 18) attests to it as traditional by the eleventh century. Clement of Alexandria (*Stromata* 1. 21, 146), writing shortly after the death of the emperor Commodus in 192, reports a number of calendar dates as having been suggested by various persons for the date of the Passion. None of them corresponds to either 23 March or 25 March. There was no firm Alexandrian tradition about the calendar date of the Passion in Clement's time, but 25 March had become the traditional date of the Resurrection by the time of Annianus. Africanus, writing about 30 years after Clement, is a good candidate for the authorship both of the tradition that the Resurrection took place on 25 March and that the year was AD 31.

Grumel believed that Africanus adopted the year that he did as the first year of the cosmos, at least in part because 22 March—the Ptolemaic date of the equinox—was a Sunday in that year. As I have argued in Ch. 8, the premise is false. The 21st of March was already the conventional date of the equinox in the third century.

Africanus is likely to have been pleased rather by the correspondence between 25 March as the date of the Resurrection and the same day as the date for the creation of the sun and the moon. Africanus seems to have counted his cosmic years as beginning on 25 March, not 22 March. The date is appropriate, since time and the calendar cannot begin before the creation of the sun and the moon. Hence the community of the Dead Sea Scrolls had a 364-day calendar that always began on a Wednesday (Vanderkam 1998). The light that suffused the creation from the beginning and that God called 'day' (Genesis 1. 3–5) was a divine illumination different from that of the sun, as Basil of Caesarea explained in his homilies 'On the Six Days' (2. 8). Syncellus (3. 1–2) cites Africanus as calling that first day 'noetic', because the first-created light was not yet organized.

4. THE CHRONOLOGICAL SYSTEM OF AFRICANUS

Africanus dated the Passion and Resurrection to the Roman year corresponding to 31, at the turn of the cosmic year 5531/2. Just as his count of 5531 years from Adam to the *parousia* is consistent with 5532 as the year of the Resurrection, so also the count of 5500 years from Adam to the *epiphania* of the Saviour implies the year 5501 for the Nativity. Africanus' date for the birth of Christ therefore corresponded to 1 BC. This conclusion differs from the scholarly consensus represented most recently by Wallraff (2007: xvii, 351–2) that Africanus dated whatever he meant by the *epiphania* (Incarnation or Nativity) to Olympiad 194.2, synchronized with the the year 5500 from Adam and corresponding to 3/2 BC. For Africanus to have used three different calendars—the Olympic year, the Roman year, and the cosmic year—may seem cumbersome. As Wallraff (2007: xxviii) rightly emphasizes, however, the numbering of the years from Adam was the foundation of Africanus' system. Africanus inserted his Olympiad chronology into that system. Nisan was the first month of the Biblical calendar. It was in the month of Nisan that the Exodus took place, in the month of Nisan that Nehemiah set forth to rebuild Jerusalem and presumably in the month of Nisan that God created the world. For Africanus to have dated these events other than at the beginning of his years from Adam would be far more illogical than for him to have counted the Olympiads as including parts of two cosmic years.

A brief review of the most important passages where Syncellus cites Africanus for numbered years from Adam will show that this hypothesis is the best way to account for the evidence.

i. Chronological Summaries

The chronological summaries that Syncellus cites from Africanus begin with a series of intervals representing the patriarchal generations, with a running sum of the total number of years elapsed since Adam at the end of each generation. The procedure is analogous to that of the Astronomical Canon, where the running totals all mark the last year of a monarch's rule. Philip Arrhidaeus ruled for 7 years, and the first number in the column for totals is 7. Augustus ruled for 43 years with a running total of 337. One can say that there are 337 years from Philip to the first year of Tiberius, but the first year of Tiberius is the year 338.

The most nearly complete example is Africanus' summary of the generations from Shem to Abraham, which Syncellus (97. 4–18) quotes as follows:

> After the Flood Shem begat Arphaxad.
> Arphaxad at the age of 135 begets Sala. 2397.
> Sala at the age of 130 begets Eber. 2527.
> Eber at the age of 134 begets Phalek. 2661.
> Phalek at the age of 130 begets Ragau and after living another 209 years he dies.
> From Adam to the death of Phalek 3000 years.
> Ragau at the age of 132 begets Serouch.

Serouch at the age of 130 begets Nachor.
Nachor 130, Thara.
Thara at the age of 70: Abraham, and Nachor and Arran.
Altogether therefore to the entry of Abraham into the promised land there are from Noah and the Flood 10 generations, 1015 years, from Adam 20 generations, 3277 years.

The starting point for these intervals is the year of the Flood. Syncellus (94. 15–17) quotes Africanus as stating that Noah was 600 years old at the time of the Flood, with a total of 2262 years from Adam. Syncellus (91. 23–92. 4) quotes the generational intervals of Africanus from Adam to Noah. He does not include the running totals, but their sum is 1662. The year 1 of Noah is therefore 1663 and the year 600 is 2262. The *Chronicon Paschale* (36. 17–21) also cites Africanus for dating the Flood to the 600th year of Noah and 2262 from Adam.

The generational intervals from Lamech to Arphaxad would be as follows:

Lamech at the age of 187 begets Noah. Total 1662. (Syncellus 92. 4.)
Noah at the age of 500 begets Shem. Total 2162. (Gen 5: 32.)
Shem at the age of 100 begets Arphaxad. Total 2262. (Gen 11: 10.)
Arphaxad at the age of 135 begets Sala. 2397. (Syncellus 97. 6.)

The year 2262 is the year 600 of Noah and the year that Shem begat Arphaxad. The year 2263 is the year 1 of Arphaxad. The Book of Genesis (11: 10) says that Arphaxad was born after the Flood. Therefore 2262 is the year of the Flood, rather than the interval from Adam to the Flood. The epoch of the Flood represents the end of the primordial period.

The number 2262 is distinctive of Africanus. Other chronologists, including Eusebius (p. 15 Helm) and Syncellus (59. 16–26), counted 2242 years from Adam to the Flood. Most manuscripts of the Septuagint version of Genesis 5. 25 give the age of Methuselah when he begat Lamech as 167 years. Syncellus says (20. 7–9) that Africanus followed a defective version and made Methuselah 187 years old at that time. The author of the *Chronicon Paschale* says that Africanus followed the best manuscripts in doing so. The number 187 also appears in the Hebrew (Masoretic) text and in corrections entered into the Codex Alexandrinus of the Septuagint. The Samaritan Pentateuch has what was probably the original reading with 67 years (Klein 1974).

The Book of Genesis says (5: 32 in the Greek version) that Noah begat Shem at the age of 500, that the Flood occurred in the 600th year of Noah's life (8: 11), and that Shem begat Arphaxad at the age of 100 (11: 10). Yet Noah took no grandchildren with him into the ark, and the account of Genesis therefore explicitly states (11: 10) that Arphaxad was born two years after the Flood.

Africanus finessed this problem by stating that Shem begat Arphaxad after the Flood, while not explicitly stating his age at the time. The year 2262 was both the year of the Flood and the year 100 of Shem, but the first year of Arphaxad was 2263 and therefore 'after the Flood'.

In the summary at Syncellus 97. 4–18, the total from Adam to the year when Nachor begat Abraham is 3202. Syncellus elsewhere (104. 20) explicitly cites Africanus for a count of 3202 years from Adam to the first year of Abraham. The chronological summary at the end of the generational intervals counts 3277 years from Adam to the entrance of Abraham into the promised land. Syncellus repeats that summary in an excerpt (112. 16–21) from 'Africanus on Abraham'. The interval from 3202 to 3277 is consistent with the statement of Genesis (12. 4) that Abraham was 75 years old when he left Haran.

There are fragments from several other such summaries. Syncellus cites Africanus for 3563 years from Adam to the death of Joseph (122. 1–3), 4292 years until the end of the Judges and the beginning (or 'rule') of Eli (205. 17–18), 4457 years until the eighth year of Solomon and the completion of the temple (213. 1–5), 4750 years to the end of the northern kingdom of Israel and the beginning of the first captivity (241. 26–242. 3), and 5472 years from Adam to the end of Ptolemaic rule in Egypt and the death of Cleopatra (372. 26–9).

In most of these instances it is clear that the numbered year from Adam represents the end of a period and that the next epoch begins at the turn of the next year. The death of Phalek in the year 3000 marks the end of the first half of ordinary human history, and the second half begins in 3001. Joseph died in 3563 and the first year of oppression in Egypt was 3564. The last year of the Judges was 4292, and the first year of Eli was 4293. Solomon began the temple in the second year of his reign, the 14th of his life, he worked on it for seven years, and he completed it in the eighth year of his rule, the 20th of his life. Therefore the year 4457 represents the end of the work, and the First Temple Period began in 4458.

ii. The Last Year of Cleopatra

The summary of 5472 years from Adam to the death of Cleopatra is a crucial case, because we know the regnal dates of Cleopatra from the Astronomical Canon. The text of Syncellus synchronizes 5472 with the 4th year of the 187th Olympiad and the 11th year of the Roman monarchy. As I have already argued, the '4th' year must be a scribal error for the '2nd' year. The '11th' year of the Roman monarchy may be another textual error. Most authors date the Roman monarchy from the first year of Julius Caesar in 48 BC.[13] In that case, the last year of Cleopatra in 31/0 BC is the 18th or 19th year of the monarchy. Wallraff (2007: 267) emends the numeral to 14th. If Africanus meant to state in what year of the reign of Augustus the fall of Alexandria occurred, he would most likely have made it the 14th, in agreement with the general consensus that Augustus ruled for 56 years at Rome, 43 at Alexandria.[14]

If Africanus had the correct date for the last year of Cleopatra in Olympiad 187.2, the year 5472 from Adam, then the year 5723 corresponded to the 250th Olympiad 251 years later. Other numbers will also fall into place, provided one assumes that Africanus accounted for the differences among the Roman, Alexandrian, and cosmic calendars.

The 16th year of Tiberius corresponded to Olympiad 202.1, AD 29/30, by the Alexandrian calendar, but to the year 30 by the Roman calendar. Thus the 16th year of Tiberius began in Olympiad 202.1. Olympiad 202.2 began during the 16th year of Tiberius, and it is with Olympiad 202.2 that Africanus coordinated the 16th year of Tiberius chronographically. If Africanus counted his cosmic years from approximately the time of the vernal equinox, then the year 5472 began during the last year of Cleopatra and during Olympiad 187.2 in March 30 BC. The year 5531 began during Olympiad 202.1, and the 16th year of Tiberius began during Olympiad 202.1, synchronized with that Olympiad in Alexandria, but beginning in January AD 30 in Rome. Olympiad 202.2 began during the 16th year of Tiberius. The year 5532 began during Olympiad 202.2, the year of the Passion. The year 5723 began during the first year of the 250th Olympiad, AD 222.

The excerpt from 'Africanus on the Passion' quotes him for 60 years of Roman rule from the end of the Ptolemies to the 16th year of Tiberius. Counted from Olympiad 187.2, there is an interval of 60 years to Olympiad 202.2. There is a corresponding interval of 60 years from 5472, the last year of Cleopatra, to 5532, the year of the Resurrection.

Both Gelzer and Richard add 60 to 5472 to yield 5532 as the 16th year of Tiberius. Richard claims that Africanus must have given Augustus 44 years of rule in Alexandria, instead of the 43 years of the Astronomical Canon. No synchronism between 5532 and the 16th year of Tiberius is attested in the fragments. The proposition that Africanus falsified the years of Augustus is itself false. The first year of Roman rule in Alexandria was Olympiad 187.3, and the cosmic year 5473 began within that Olympiad. The 43rd and last year

[13] Clement, *Stromata* 1. 21. 144; Theophilus, *ad Autolycum* 3. 27.
[14] Theophilus, *ad Autolycum* 3. 27; Syncellus 376. 13; see Ch. 16.

of Augustus was Olympiad 198.1, and the cosmic year 5515 began within that Olympiad. Olympiad 198.2 was the first year of Tiberius, within which the year 5516 began. The 16th year of Tiberius was Olympiad 202.1, within which the year 5531 began. In these calculations, the Olympiad year is synchronized with the Alexandrian civil year beginning 1 Thoth = 29 August.

In the Roman calendar, the chronographic 16th year of Tiberius began four months later, in January, during Olympiad 202.1. It was within that 16th year of Tiberius that Olympiad 202.2 began. There are therefore sixty years from Olympiad 187.2, the last year of Cleopatra, to the 16th year of Tiberius and Olympiad 202.2, and 60 years from the cosmic year 5472 to the year of the Resurrection in 5532. The year 5532 is chronographically coordinated with Olympiad 202.2, but it does not overlap with the 16th year of Tiberius. Likewise, the 250th Olympiad began in the third year of Elagabalus, the consulship of Seleucus and Gratus. The year 5723 began during the 250th Olympiad, but it does not include any part of the consulship of Seleucus and Gratus.

The chronological summary of 5472 years from Adam to the last year of Cleopatra appears in the midst of a narrative that Syncellus entitles 'Africanus on the affairs of Hyrcanus and Antigonus and also concerning Herod, Augustus, Antony, and Cleopatra, in summary'. As the title suggests, the passage as a whole is probably an epitome, rather than a verbatim extract. At several points, this summary notes the observance of Olympiads 185, 186, 188, and 189. None of these notes has the specificity of the summary of the years from Adam to the end of the Ptolemies, and none is associated with a numbered year from Adam.

Unger (1867: 37) thought that these Olympiad dates belonged to the immediately preceding narrative. More likely, they refer to what follows. The events narrated between the notices of the 185th and 186th Olympiads belong to the 185th Olympiad. These events include the siege of Jerusalem and the death of Antigonus, the last legitimate king of Judaea, which Josephus (*Antiquities* 14. 487) dates to the consulship of Marcus Agrippa and Caninius Gallus (37 BC) and the 185th Olympiad (40–36 BC). Syncellus' narrative from the notice of the 186th Olympiad to the fall of Alexandria belongs to the 186th Olympiad and the first part of the 187th.

Immediately after the chronological summary of 5472 years from Adam to the last year of Cleopatra, the text reads (373. 1), 'after the fall of Alexandria, the 188th Olympiad was observed'. This note does not imply that the fall of Alexandria is in fact to be dated to Olympiad 187.4, but that what follows happened during the 188th Olympiad. The narrative then summarizes the cities that Herod refounded, including Samaria renamed in honour of Augustus as Sebaste and Strato's tower renamed Caesarea. Later, the text adds, he also founded Antipatris in honour of his father. These foundations belong to various dates. Josephus does say (15. 217) that Herod acquired Samaria and Strato's tower from Augustus shortly after the fall of Alexandria, so that the 188th Olympiad would be an appropriate point to mention these new cities.

The narrative ends with a badly corrupted note about the observance of the 189th Olympiad. The text reads, literally translated, 'it was Olympiad 189, which was observed the 6th day before the Kalends of March, 24th according to the Antiochenes, whereupon the year was set on proper limits'. Unger (1867: 36–7), maintaining that the Olympiads refer to the preceding text, argued that the epitome of Africanus ended with the note, 'it was Olympiad 189', and that Syncellus had the remainder of the text from some other source. He takes '24 according to the Antiochenes' as a reference to the era of Antioch, in which the 24th year is 26/5 BC, within the 188th Olympiad, not the 189th. Wallraff (2007: 269) also regards the concluding text as an interpolation.

As Unger recognized, the sixth day before the Kalends of March and the setting of the year within its proper limits are references to the introduction of leap year at Alexandria. That Syncellus interpolated this sentence into the epitome from Africanus is unlikely. The first leap day was inserted into the Alexandrian calendar at the turn of the year from 23/2 to 22/1 BC (see Ch. 16). That year is within the 189th Olympiad. The sixth day before the Kalends of March is 24 February. The original text must have said that leap-day in Alexandria was the day before 1 Thoth in Alexandria, but the sixth day before the Kalends of March in Rome and the 24th day of the Macedonian month of Peritios (February) in Antioch.

iii. The Entrance of Abraham into the Promised Land

The summary of 3202 years from Adam to the first year of Abraham and 3277 years to the entrance of Abraham into the promised land is an especially instructive example. Just as the year 1 of Noah was 1663 according to the generational intervals and the year 1 of Arphaxad was 2263, so also the first year of Abraham was 3203 and his entrance into the promised land 3278.

Syncellus comments on the summaries for Abraham in the same way that he did on the summary of 5531 years from Adam to the *parousia*. He twice quotes Africanus (97. 16–18, 112. 17–20) for a summary of 3277 years from Adam to the entrance of Abraham into the promised land. In commenting, Syncellus says (105. 3–4) that according to Africanus Abraham entered the promised land 'in' the year 3277 of the cosmos. Whenever Syncellus quotes directly from the text of Africanus, the years are counted from Adam. The designation of the year 3277 as 'of the cosmos', rather than 'from Adam' suggests that this is an inference on the part of Syncellus, not a direct quotation from Africanus. Similarly, in the account of the Passion, Syncellus quotes Africanus for an interval of 5531 years 'from Adam' to the *parousia*. Two pages later, he says that Africanus synchronized the Passion and Resurrection with the year 5531 'of the cosmos'.

iv. The First Year of Cyrus

The year 3277 is the interval from Adam to the entrance of Abraham, not the year when he entered. To show that this conclusion is correct and that these years must have been counted from the anniversary of creation in the month of March, we can count forward from 3277 using intervals attested or reasonably hypothesized for the Biblical chronology of Africanus until we reach an intersection with his Olympiad chronology at the first year of Cyrus.

Although the extant fragments make no reference to it, Africanus must certainly have accepted from the Greek version of Exodus (12: 40) and from Paul's letter to the Galatians (3: 17) that the interval between the promise to Abraham and the Exodus was 430 years. That interval added to the 3277 would yield a summary from Adam to the Exodus of 3707 years. Eusebius cites Africanus for the intervals for the period between the Exodus and the first year of Cyrus as follows: 'Moses 40, Joshua 25, the Elders 30, the Judges 490, Eli and Samuel 90, the Kings 490, <70 years of Captivity>, the last year of which was the first year of Cyrus.[15] The total of these intervals is 1235, although Eusebius also quotes Africanus for a sum of 1237, for reasons I shall explain later.

The sum of 585 years from Moses to Eli confirms the statement of Syncellus that Africanus counted 4292 years from Adam to the last year of the Judges and the first year of Eli, for $3707 + 585 = 4292$. Therefore 4292 was the last year of the Judges and the first year of Eli was 4293.

The total interval of 1235 years added to the epoch of the Exodus at 3707 yields a sum of 4942 years to the end of the captivity and the first year of Cyrus. This result is consistent with an unattributed chronological summary in the chronicle of Symeon the Logothete (p. 38 Bekker), which counts 4872 years from Adam to the captivity. The phraseology is similar to the chronological summaries that Syncellus quotes from Africanus.

Earlier in the same discussion, Eusebius has already quoted Africanus as saying that Cyrus became king 'after' the 70 years of captivity, that the first

[15] Eusebius, *PE* 10. 9–10, 15–23; the 70 years of captivity must be supplied to fill an obvious lacuna in the text.

year of Cyrus was also the first year of the 55th Olympiad, and that Cyrus in the first year of his reign sent forth the first of the captives under the leadership of Zerubbabel. The Book of Ezra (1: 1–4) says that in his first year Cyrus issued a proclamation for the return of the people to Judah and the beginning of the temple. Since the 1235 years end in the first year of Cyrus, that year was both the last of the 70 years of captivity and the first year of liberation.

It follows that 4942 was the end of the captivity and that the exiles set forth at the beginning of 4943. The first year of the 55th Olympiad corresponds to 560/59 BC. If the first year of Cyrus was both the last of the 70 years of captivity and the first year of liberation, then Africanus must have synchronized Persian regnal years with Olympiad years beginning in the summer, while synchronizing Biblical years with the cosmic year beginning in March. Thus 4942, the last year of captivity, began in March 560. The first year of Cyrus began in summer 560, synchronously with the first year of Olympiad 55.The year 4943, the first year of liberation, began in March 559 BC, still within the first year of Cyrus.

The result is then consistent with a synchronism between Olympiad 187.2 and 5472 as the last year of Cleopatra. In the excerpt from Africanus on the seventy weeks of years, Eusebius quotes Africanus for 300 years of Persian rule and 230 for the Macedonians. If the year 4943 is the first year of Cyrus, then the year 5472 will count as the 530th year of Persian and Macedonian rule. Likewise, Olympiad 187.2 is the 530th year counted from Olympiad 55.1.

Failure to observe these turning-points from one epoch to the next, as well as the differences in calendar years, can lead to difficulties. Gelzer (1898: i. 43) calculated 4942 as the end of the captivity and the first year of Cyrus. He coordinates the year 4942 with Olympiad 55.1 as the first year of Cyrus and makes that 'the fixed starting point for reckoning intervals both backwards and forwards'. Elsewhere (1898: i. 104) he counts 4972 as the last of the 30 years of Cyrus, which implies that the first year was 4943. At one point (1898: i. 103) he chastises Africanus for dating both the end of the captivity and the return of the exiles to the same year, the first year of Cyrus. In another passage he says (1898: i. 215) that Africanus must have dated the restoration to the second year of Cyrus.

Gelzer counts 4942 from January of 560 BC and Olympiad 55.1. Accordingly, he coordinates the year 5472 with Olympiad 187.3, instead of Olympiad 187.2, which is not consistent with his claim that the year 5532 began in January of AD 31 and Olympiad 202.2. When he confronts the synchronism between 5723 and the 250th Olympiad, he is forced (1898: i. 45–51) to assume that Africanus made a mistake in his Roman chronology for the period between Tiberius and Elagabalus. With 4943 counted as the first year of

Cyrus and beginning during March in the first year of the 55th Olympiad, everything else fits.

Working back from 4943, we find that the year of the Exodus was 3708, as Gelzer correctly noted (1898: i. 36, 42, 49, 103 n. 1). The last of the 430 years in Canaan and Egypt was therefore 3707, and the entrance of Abraham into the promised land was 3278. Summarizing 3277 years from Adam until the entrance of Abraham into the promised land, Africanus meant that 3277 was the last year in Haran and that Abraham entered Canaan at the beginning of 3278.

When Syncellus said (105. 3–4) that Africanus dated the entrance of Abraham into the promised land 'in' the year 3277, he made the same mistake that he did when concluding (394. 25, 395. 21) that Africanus dated the Passion 'in' the year 5531. The conclusion most consistent with his other chronological summaries is that the count of 5500 years from Adam to the *epiphania* of Christ entails the year 5501 for the birth of Christ and the summary of 5531 years to the *parousia* means (as either Africanus himself stated or the glossator thought) that the *parousia* of Christ at the end of the 70 weeks of years refers specifically to the Resurrection at the beginning of the year 5532.

v. The Year of the First Olympiad

The difference between Olympiad years beginning in summer and cosmic years beginning in March will explain the variation in our sources about the year to which Africanus dated the first Olympiad.

According to Eusebius (*PE* 10. 9–10, 15–23), Africanus expressed an interval of 1237 years from the Exodus to the first year of Cyrus. The same interval separates the great flood of Greek legend in the time of Ogygus from the 55th Olympiad and the first year of Cyrus. There are 1020 years from Ogygus to the first Olympiad and 217 years from the first Olympiad to Cyrus. The excerpt also gives the individual intervals from Moses to Joshua, the Judges, the Kings and the end of the Captivity. Their sum is only 1235 years. Syncellus (71. 7–27) gives the total interval as 1235 and the interval from the first Olympiad to Cyrus as 215. Wallraff (2007: 77) believes Syncellus has the original readings. It is more likely, however, that someone would have 'corrected' 1237 to 1235 than have generated 1237 from the sum of the intervals.

Africanus was drawing a parallel here between Greek history and the Biblical narrative. In the *Timaeus* (22), Plato refers to a legend that there was once a great flood, from which only Deucalion and his wife Pyrrha survived.[16]

[16] For the story see Ovid, *Metamorphoses* 1. 262–427.

Africanus wants to show that even the legendary history of the Greeks is of lesser antiquity than Biblical history. Eusebius and Syncellus quote him as following a version of the story according to which the Flood took place in the time of Ogygus, the founder of Attica. Africanus says that there is the same interval, 1237 years, between the time of Ogygus and the 55th Olympiad as from the Exodus to the first year of Cyrus and the end of the Captivity.

Africanus divides the interval into 1020 years from Ogygus to the first Olympiad and 217 years from the first Olympiad to Cyrus. The total is 1237. If one counts the same total backwards, Africanus says, from the end of the captivity, one will find the same interval from there to the first year of the Exodus as from the 55th Olympiad to Ogygus.

Trieber (1880: 50, 57) sought to resolve the problem by arguing that Africanus counted each of the intervals 1020 and 217 separately, with both ends included, so that a true total of 1235 years could also be expressed as 1237. Gelzer (1898: i. 39–44) characterized this solution as a chronographic 'monstrosity'. Gelzer brought forth a monster of his own. He suggested that Africanus reckoned by some combination of Julian years of 365¼ days and Egyptian mobile years of 365 days, so that 1235 years in one system is the same as 1237 in the other. The arithmetic does not support the hypothesis. A sum of 1237 Egyptian years totals 451,505 days, which approximates 1236 Julian years (451,449 days), not 1235.

The sum of 1237 years derives from the overlap between years counted from Adam and years counted by Olympiads. Africanus synchronized the first year of Cyrus with the first year of the 55th Olympiad beginning in summer of the year 4942, which had begun in March. The year 4943 began in March during the first year of Cyrus. It follows that the first Olympiad was observed during the year 4726 and that the year 4727 began during the first Olympiad. Africanus could therefore say that from the first Olympiad (4726) to the first year of Cyrus (4943) there is an interval of 217 years. The epoch of the Exodus in a chronological summary was 3707. There is an interval of 1020 years from that epoch to the year 4727, which began during the year of the first Olympiad.

The overlap between cosmic years and Olympiads will also explain why Syncellus (233. 11–17) says that Africanus dated the first Olympiad to the first year of Ahaz as king of Judah, while Eusebius in his chronicle (p. 86 Helm) claims Africanus put the first Olympiad in the time of Jotham. Gelzer (1898: i. 33) and Burgess (1998: 42) have accused Eusebius of dishonesty in this matter, and Wallraff (2007: 189) regards Eusebius' statement as misleading. In fact, both Eusebius and Syncellus are correct. According to Gelzer's reconstruction of Africanus' Judean chronology (1898: i. 33, 93), the last year of Jotham was 4726 and the first year of Ahaz was 4727. It was therefore during the last year of Jotham that the first Olympiad was celebrated, and it was during the first year of the first Olympiad that Ahaz became king.

The chronological system of Julius Africanus as I would reconstruct it can be summarized as follows. I use the standard scholarly abbreviation AM (*Anni Mundi*) for years of the world:

AM 1 = Wednesday, 25 March 5501 BC, creation of the sun and the moon.
AM 3708, 25 March 1794 BC, Exodus from Egypt.
AM 4726, 25 March 776 BC, last year of Jotham.
Olympiad 1. 1, 776/775 BC.
AM 4727, 25 March 775 BC, first year of Ahaz.
AM 4942, 25 March 560 BC, last year of the Captivity.
Olympiad 55.1, 560/559 BC, first year of Cyrus.
AM 4943, 25 March 559 BC, first year of liberation.
Olympiad 83.3, 446/445 BC, 20th year of Artaxerxes.
AM 5057, 25 March 445 BC, Nehemiah sets forth for Jerusalem.
Olympiad 83.4, 445/444 BC, Dedication of Jerusalem, beginning of the 70 weeks of years.
Olympiad 187.2, 31/30 BC, last year of Cleopatra.
AM 5472, 25 March 30 BC, during the last year of Cleopatra.
AM 5501, 25 March 1 BC, Incarnation of Christ
AD 30, 16th year of Tiberius.
Olympiad 202.2, AD 30/1, completion of the 70 weeks of years, in solar year 475.
AM 5532, 25 March AD 31, the Resurrection.
AD 221, consulship of Seleucus and Gratus, third year of Elagabalus.
Olympiad 250.1, 221/2, archonship of Philinus.
AM 5723, 25 March AD 222, terminus of the *Chronographiae*, in the 250th Olympiad.

5. AFRICANUS AND THE 19-YEAR CYCLE

The years 3708 (Exodus), 4943 (Cyrus), and 5532 (the Resurrection) are all separated by whole multiples of 19 and therefore share the same lunar data on a 19-year cycle. The interval of 475 solar years between the 20th year of Artaxerxes and the 16th year of Tiberius is also a multiple of 19. With the 20th year of Artaxerxes numbered as the 115th of the Persian empire, the interval of 114 years between the first year of Cyrus and the 20th year of Artaxerxes is another multiple of 19.

The year 5723, the present year when Africanus finished his work, is 191 years after the Resurrection. The year 5722, beginning 25 March 221, therefore presented the same lunar data as the year of the Resurrection. The years corresponding to 31 and 221 also share the same sequence of weekdays, beginning from 1 January on a Monday.

That Africanus knew the 19-year cycle is clear from the explanation that Syncellus quotes from him for the precise length of the solar year as 365 plus 5/19 days and of the lunar month as 29.5 + 7.5/235 days. Syncellus also quotes him as stating that the Passion took place on the day before the 14th day of the moon, so that the darkness that fell upon the earth at that time cannot be explained away as the result of a solar eclipse.

Africanus could have built his entire system on the basis of the calendrical data for the consulship of Seleucus and Gratus, AD 221. In that year, 25 March was a Sunday; and there was a full moon on that date. Astronomical calculations produce a new moon on 11 March shortly after noon. The 8-year Paschal cycle of Hippolytus, which took effect from the 14th day of the moon on 13 April 222, produces a 14th day of the moon in years corresponding to the eighth of a cycle on 25 March (see Ch. 7). The cycle of Hippolytus derived from Alexandria. Africanus had visited Alexandria and probably learned of the 8-year cycle then in use. Africanus also knew of the 19-year cycle and decided it provided a more nearly accurate basis for projecting Paschal dates backwards and forwards. Geminus had described the 19-year cycle in the first century BC, and Africanus may have known that work. Diodorus Siculus (12. 36) said that Meton published his 19-year cycle at Athens during the archonship of Apseudes, 433/432 BC. Diodorus was among the sources of Africanus. Africanus cites him for the date of Cyrus as corresponding to the first year of the 55th Olympiad (Eusebius, *PE* 10. 10. 10). From one source or another, Africanus knew the 19-year cycle and used it to generate his chronographic system.

Africanus accepted the tradition associating 25 March with the events of the Passion and specifically with the day of the Resurrection. He looked for a year shortly after the 15th year of Tiberius when 25 March was a Sunday at the approximate time of a full moon. He knew, either from observation or from the Alexandrian version of the 8-year cycle, that there was a full moon on Sunday, 25 March 221, the last year of the 249th Olympiad. There should therefore have been a full moon on that date 190 years earlier, the second year of the 202nd Olympiad. Africanus could not date the Resurrection to a Sunday on the 14th day of the moon without contradicting the Biblical account. He could interpret the Gospel according to John as implying that Jesus was crucified in the afternoon, a few hours before the beginning of Passover on the 14th day of the moon. He therefore decided to date the 14th day of the moon to Saturday, 24 March, beginning in the evening of 23 March in the Jewish tradition.

Africanus also accepted the idea that 5500 years would elapse from Adam to the coming of the Saviour, attributing that tradition to Jewish authorities. He decided to date the Incarnation and Nativity to the year 5501 of the world. If 5501 counts as the first year of Christ, then his baptism on the traditional date in January at about the age of 30 should belong to the end of the year 5530. Following the short chronology for the career of Jesus, Africanus concluded that Jesus was crucified a little more than a year later at the end of the year 5531 and rose from the dead at the beginning of 5532.

The designation of Olympiad 202.2 as corresponding to the year 5532 from Adam led to 5723 as corresponding to the 250th Olympiad. At the other end of the calculation, the resulting year 1 began on Wednesday, 25 March, the day that God inaugurated the course of the sun and the moon.

Africanus proceeded to generate dates for the Exodus from Egypt and for the return of the exiles from Babylon by combining his reading of the Bible with calculations based on the 19-year cycle. According to the Book of Exodus (12: 29–31), the first Passover took place at midnight, and Moses led the people out of Egypt the next day. Calculating that year as the end of 3707 and the beginning of 3708, Africanus could say that the first Passover occurred on 24 March, the 14th day of the moon, and that the Exodus from Egypt began on 25 March, typologically foreshadowing the true era of salvation. Similarly, the recapitulation of the Exodus that Isaiah (40: 3, 45: 1) depicts as having taken place during the reign of Cyrus began during the week of Passover on 25 March, the first day of the cosmic year 4943. When Nehemiah set forth for Jerusalem during the month of Nisan in the 20th year of Artaxerxes, it was on 25 March, the day after Passover at the beginning of the year 5057. The 25th of March of the year 3278, when Abraham entered the promised land, does not fit the pattern, and for good reason. St Paul gave the interval of 430 years between the promise to Abraham and the giving of the Law, and it is not a multiple of 19.

6. AFRICANUS AND THE CHRISTIAN ERA

Africanus dated the Resurrection to 25 March at the beginning of the year 5532 from Adam and in the year corresponding to AD 31. His date for the Incarnation and the Nativity was during the year 5501, corresponding to 1 BC, and his Christian era began on 25 March of 1 BC. Grumel (1958: 23) maintained that this year 5501 was one year earlier than the Christian era of Dionysius Exiguus. The differential is less than a year, and it may reflect only the differences in calendar years.

When Panodorus dated the Nativity to the year 5493 of his Alexandrian era, he did no more than reassert the traditional date of Julius Africanus against the distorted chronology of Annianus. In place of the natural year of Africanus and Annianus beginning on 25 March, Panodorus used the Alexandrian civil year beginning 1 Thoth = 29 August. His year 1 of Christ, if he had chosen to number years that way, would correspond to 1 BC/AD 1. Similarly, the Christian era of Dionysius Exiguus derives from the same date for the Nativity, with the year 1 now synchronized either with the indictional year beginning on 1 September or with the Roman civil year beginning the following January.

As a bilingual scholar and the translator of several works of Greek patristic literature, Dionysius Exiguus might have found a date for the Nativity corresponding to the turn of the year 1 BC/AD 1 directly in the works either of Julius Africanus or of Panodorus. The matter-of-fact way that he reports a synchronism between the 248th year of Diocletian and the year 532 of the Lord suggests, however, that Dionysius found that equation already embedded within his Alexandrian sources.

18

Anatolius and the Christian Era

1. ANATOLIUS AND AFRICANUS

As far as we know, Anatolius of Alexandria and Laodicea was the first to use the 19-year lunisolar cycle to generate a list of Paschal new moons. Julius Africanus was already familiar with that cycle at least forty years before Anatolius published his 95-year list. Africanus used the 19-year cycle to calculate what he believed to be the true length of the solar year and the lunar month. Having established 25 March 5532 as the date of the Resurrection, Africanus generated a date for the Exodus from Egypt 96 cycles earlier on 25 March 3708, as well as dates for other significant events in Biblical history at intervals that are multiples of 19.

The first year of an Anatolian cycle, with a new moon on 26 Phamenoth = 22 March, corresponds on the 19-year cycle to the end of the first year of the world according to the cosmic era of Africanus and the beginning of the second. Grumel (1958: 33–5) saw here the origin of what he believed to be the later Byzantine distinction between cycles according to nature and according to convention. As I have argued in Ch. 13, Grumel's whole theory of a 'cycle according to nature' as beginning in the second year of the world rests on a misunderstanding of the *Chronicon Paschale* and a perversion of the usual meaning in Greek of the distinction between 'nature' and 'convention'.

Grumel was nevertheless right to suppose that Anatolius knew of the 19-year cycle from Africanus and perhaps also adopted his cosmic era. His choice of the new moon of 26 Phamenoth for the first year of his cycle represents recalibration of the year 1 to begin in synchronism with the Alexandrian civil year on 1 Thoth = 29 August, rather than from the date of the creation five months earlier in March.

We do not know how Anatolius numbered the years of his cycle. Most likely, he numbered them from 1 through 95, rather than by reference to the cosmic chronology of Africanus. He must, however, have given instructions in the preface as to how his year 1 should be coordinated with standard chronologies.

In the *Chronicle* (p. 223 Helm), Eusebius notes the fame of Anatolius in an entry that appears at Olympiad 264.3, AD 277/8, aligned with the second year of Probus. Immediately following is a note coordinating the second year of Probus with the eras of several Syrian cities—Antioch, Tyre, Laodicea, Edessa, and Ascalon. Rudolf Helm (1923: 42) suggested that this note marked the end of an earlier draft of the *Chronicle*. Grumel (1958: 49–53) argued on the contrary that Eusebius took this set of synchronisms from the Paschal work of Anatolius. Grumel concluded that Anatolius had drafted his 95-year table beginning retroactively from 258, but that he published it with an effective date in the 270s.

Grumel may well have been right. If so, Anatolius used these synchronisms to inform the reader that the 20th year of his 95-year list was the second year of Probus, the year 325 of the era of Antioch, 402 of Tyre, and so forth. The year 1 of Antioch corresponded to 49/8 BC, so that the 325th year would be AD 276/7. Probus became emperor in 276, but the Astronomical Canon antedated his first year to 1 Thoth of 275, in the year 499 from the death of Alexander (Mommsen 1898: 449). As an Alexandrian, Anatolius would have followed that convention, dating the second year of Probus to 276/7.

In publishing a table of Paschal dates, Anatolius would probably also have wanted to indicate how the numbered years of his list related to the chronology of Christ. He may well have adopted the Christian era of Africanus, moving the beginning of the Christian year 1 from 25 March to 1 Thoth, synchronized with the Alexandrian calendar year numbered as the 30th year of Augustus and corresponding to 1 BC/AD 1. In that case, he would have informed the reader that the second year of Probus, corresponding to 276/7, was the year 277 from Christ, thus anticipating the Christian era of Dionysius Exiguus.

Africanus' year beginning 25 March would be inappropriate for an Easter table, because the 14th day of the moon can occur as early as 21 March. As explained in Ch. 8, Anatolius began his cycle with a lunar new year on 1 Nisan = 26 Phamenoth (22 March), choosing that date in part because of its calculated lunar correspondence to the last epagomenal day of the previous Alexandrian civil year. His numbered years (1–95) must have been coordinated with the Alexandrian civil year, rather than with a year beginning on either 22 March or 25 March, so that in the fifth year of the cycle the date of the 14th moon on 21 March would belong to the same calendar year as the Easter Sunday to follow.

Evidence that a Christian era was in fact embedded within the Paschal table of Anatolius comes from an unexpected source—the Armenians' tradition about the establishment of their own era in the year 553 since Christ.

2. THE ARMENIAN ERA

Armenian sources claim that their own 532-year cycle was an extension of the 200-year list of Andreas, which in turn preserved the ancient 19-year cycle of Anatolius. The list of Andreas began with a Paschal full moon on 4 April and ended with 25 March, so that the 14th day of the moon in the following year should have been 13 April, instead of returning to the head of the list on 4 April. Because of the resulting confusion, the Armenians established their own method of numbering the years, with the year 1 following immediately upon the end of the list of Andreas and carrying the date of 13 April as the Paschal full moon for that year (see Ch. 12).

i. The year 553 from Christ

The tradition associates the year 553 from Christ with the end of the list of Andreas and the beginning of the Armenian era. Samuel of Ani (*PG* 19. 683–4) notes at what he designates as the year 553 from Christ, 'Here the year 553 after the birth of Christ ended, at which time also the 200-year of Andreas left off. From here the era of the Armenians began.'

Edouard Dulaurier (1859: 57–66, 103, 173–8) collected fourteen texts that give a date for the establishment of the Armenian era. Five give dates only by reference to regnal years of Justinian, Chosroes, or various patriarchs. The regnal dates vary, and the sources disagree as to who was the Armenian patriarch at the time.

Of the remaining nine texts, eight use the date 553 since Christ. The earliest witnesses are Stepanos of Taron, writing in the year 454 of the Armenian era, and Hovhannes Kozern, a scholar of about the same date. Stepanos says that the Armenian era began in the year 304 of the Romans, the year 553 since Christ, 252 since Gregory the Illuminator. As I have explained in Ch. 12, 304 is a multiple of 19 and represents the interval between the era of the Romans in 248/9 and the Armenian era in 552/3. The calendar attributed to Hovhannes Kozern dates the Armenian era to the 25th year of the emperor Justinian and the 25th year of Chosroes as King of Persia, adding that when the Armenian era was established 5976 years had elapsed since Adam, 552 years since the birth of Christ. That interval is the equivalent of synchronizing Armenian 1 with Christian 553.

John the Deacon (Hovhannes Sarkavag, *c.*1100) says the Armenian era began 304 years after the era of the Romans. Hakob Ghrimetsi says the second millennium of Rome began in the year 249 from Christ (Dulaurier 1859: 49).

The interval of 304 years from the Roman era leads to the year 553 from Christ as the first year of the Armenian era. In addition to these texts, Dulaurier cited a rhymed chronicle, a prose chronicle, Kirakos, Mkhitar of Airivank, and two anonymous texts included in a collection of fragments in a Paris manuscript, all associating the end of the Paschal table of Andreas and the beginning of the Armenian era with the year 553 from Christ.

To these texts, we can add the statement at the end of the preface of Anania that the 532-year table begins in the year 828. As I explained in Ch. 12, that date probably derives from a continuator and is consistent with the year 562, one-half of a 532-year period earlier, as the beginning of the original list of Anania in the 10th year of the Armenian era. The first year of the Armenian era would then be 553, in agreement with other texts. As Dulaurier (1859: 52) states, 'there can be no doubt about this numeral'.

ii. 11 July AD 552

Since the Armenian sources say that the list of Andreas ended with a 14th day of the moon on 25 March, the absolute date must be AD 552, in which year the Alexandrian calculations produce moon 14 on 25 March. A thirteenth-century calendar (Dulaurier 1859: 101) informs us that 'in the year that the Armenian era was established, Navasard, which is the month that the Armenians place at the head of the year and which is the beginning of the Armenian era, was fixed according to the Roman calendar on 11 July. Epiphany fell on 30 Arats. The first year of our era followed upon a bissextile year.' Hakob Ghrimetsi made the same calculation. When the Armenian era was established, he says, Navasard, which is the first month of the Armenian year, began on the 11th day of the Roman month of July, and Epiphany fell on the 30th of Arats (Dulaurier 1859: 102). An anonymous text in a collection of computistical fragments agrees that in the first year of the Armenian era the feast of the Epiphany fell on the 30th day of Arats (Dulaurier 1859: 103).

The feast of Epiphany was fixed in the Roman calendar on 6 January. Arats is the sixth month in a calendar with twelve months of 30 days each plus five epagomenal days. If 30 Arats corresponded to 6 January, then 1 Navasard, 179 days earlier, corresponded to 11 July. For the names of the Armenian months and their correspondences to the Julian calendar in the first year of the Armenian era, see Ch. 12.

That 1 Navasard corresponded to 11 July in the Armenian year 1 is the result of calculations made by scholars like Ghrimetsi. That the calculation is correct can be inferred from a passage of the tenth-century historian Tovma

Artzruni. He says (3. 18, p. 174 Brosset) that King Aschot the Great died on a Thursday, the 6th day of the month of Hori, in the Armenian year 323. Hori is the second month in the calendar. If the Armenian year 1 began on 1 Navasard = 11 July AD 552, then 6 Hori 323 corresponded to 27 May 874, which was a Thursday.

Three texts with astronomical controls confirm that the Armenian year 1 began in AD 552. In interpreting the data, one must remember that the Armenians used a 'mobile' year of 365 days, so that 1 Navasard receded with respect to the Roman calendar by one day every four years.

(*a*) Stepanos of Taron says that a comet appeared on the 17th of the month Kaghots in the year 438, about the time of the feast of the Assumption, and was visible for several days (Dulaurier 1859: 279–80). This phenomenon was an apparition of the comet now known as '1P/Halley'. European chronicles report a comet under the year AD 989.[1] Astronomical calculations make Halley's comet visible with an epoch of 19 August 989, and perihelion on 3 September.[2]

The Armenian church observes the feast of the Assumption on the nearest Sunday to 15 August, which was 18 August in the year 989. Kaghots was the fifth month. If the fifth month of the Armenian year 438 corresponded to August of 989, then the month of Navasard was in April. At an interval of 437 years earlier, in the Armenian year 1, Navasard would have been 109 days later in the Roman calendar, therefore approximately in July of 552. Stepanos must, however, have made a mistake in specifying the 17th day of Kaghots. If the Armenian year 1 began 11 July 552, then 17 Kaghots of the Armenian year 438 corresponds to 7 August 989. The correct date for the Feast of the Assumption would have been 28 Kaghots.

(*b*) Aristakes Lastiverttsi (p. 41 Bedrosian) reports that 'there was an eclipse of the sun during the month of Arats, on a Friday evening, in the year 482 of our era'. The French chronicler Rodulfus Glaber (4. 9) dates a solar eclipse to Friday, the 3rd day before the Kalends of July in the year 1000 since the Passion. Astronomical calculations date an eclipse to Friday, 29 June 1033, confirming the date of Rodulfus.[3] If the year 482 corresponded to 1033, then the year 1 corresponded to some portion of 552. Again, either Aristakes or his copyist made a mistake in the calendar date. The 29th of June 1033 should have corresponded to the 19th day of the month of Tre.

(*c*) There is a reference to the famous appearance of Halley's comet in 1066 in the chronicle of Matthew of Edessa at the Armenian year 515. *The Anglo-Saxon*

[1] *Annales Quedlimburgenses*, *MGH Scriptores in Folio (SS)*, iii. 68.
[2] Calculations found at http://www.chris.obyrne.com/celestia/, accessed 29 Apr. 2006.
[3] Espenak and Meeus 2006: #7201.

Chronicle dates the first appearance of the comet to the 8th day before the Kalends of May in AD 1066. Astronomical calculations give perihelion on 19 March. The correspondence between Armenian year 515 and AD 1066 leads again to a year 1 in AD 552.

iii. AD 552 or 553?

In apparent disagreement with this equation between the Armenian year 1 and AD 552, is the statement of Samuel of Ani (*PG* 19. 683–4) and several other sources that in the 10th year of the Armenian era a new 532-year cycle was established beginning with the Paschal full moon of 4 April. That year can only have been AD 562. If the 10th year was 562, then the first was 553. In addition, the 13th-century calendar cited above says that the Armenian year 1 followed upon a leap year. That statement too seems to imply that the Armenian era began in 553.

Dulaurier concluded that there were two versions of the Armenian era. The first he calls the 'technical and chronographic' year 1, reckoned from 11 July of 553. The second he labels the 'popular' usage, with a base date of 11 July 552. Dulaurier (1859: 174–5) cites Hovhannes Kozern as saying that the Armenian era was established on the 7th day of the month of Arats. Dulaurier (1859: 51–5) suggested therefore that since the council that established the era met on 7 Arats, corresponding to 14 December of 552, some authorities counted from the previous 11 July, others from the following 11 July. Dulaurier (1859: 155, n. 161) found confirmation of this hypothesis in a passage from Hakob Ghrimetsi: 'The beginning of our era is in the year 553 from Christ according to the system (*systématiquement*), but differing according to the calculation.'

Both Rühl (1897: 219) and Ginzel (1906–14: iii. 315–17) adopted Dulaurier's conclusion. As Grumel (1958: 144) has pointed out, however, there is no evidence in the texts Dulaurier cites for an Armenian era corresponding to 11 July 553. All of the texts that connect the establishment of the Armenian era in the year 553 with the end of the Paschal table of Andreas agree that the 200-year list ended with the Paschal full moon of 25 March, and that datum can correspond only to AD 552. The texts reporting that the table of Aeas began in the 10th year of the Armenian era agree that the Paschal moon in that year fell on 4 April, and that datum can apply only to AD 562. If 552/3 was the Armenian year 1, then the tenth year of the Armenian era was 561/2. Grumel concludes that there is only one calculation of the Armenian era—that from 11 July 552—and that it is on the number of the year since Christ that the texts disagree. 'For those authors who use it', Grumel states elsewhere

(1958: 45), 'the Armenian Christian era is one or two years in advance of the common era of Dionysius Exiguus.'

3. THE ARMENIAN CHRISTIAN ERA

In stating that for some authors the Armenian Christian era is one year in advance of the Dionysian era, Grumel no doubt has in mind those texts that associate the Armenian year 1 with the Christian year 553 at a date that must correspond to AD 552. His claim that other Armenian authors use a Christian era two years in advance of the common era is perhaps based on the fact that in his chronological tables Samuel of Ani aligns the Armenian year 1 with the Christian year 554. This usage derives not from a variation in the Armenian Christian era, but from the fact that Samuel's chronicle was an adaptation and extension of the chronicle of Eusebius.

Samuel decided to begin with the birth of Christ. In the Armenian version of the chronicle of Eusebius, the notice for the birth of Christ stands at Olympiad 194.4. In his preface, Samuel says that the Nativity took place in Olympiad 194.4. Samuel begins with Olympiad 195, against which he enters both the numbers 1 and 2 of Christ. Olympiad 196.1 carries the number 6 from Christ and the chronological framework continues the correspondence from that point. Samuel apparently thinks of the Christian year as beginning in January, the Olympiad year in the summer. Thus Christ was born in January of Olympiad 194.4, and Olympiad 195.1 includes portions of both the first and the second year. By this arrangement, Olympiad 333.1, with which Samuel aligns Armenian year 1, began in the Christian year 553, in agreement with the tradition that Samuel reports. Olympiad 333.1 corresponds to AD 553/4. In Samuel's tables, that Olympiad year includes portions of what he designates as the Christian years 553 and 554.

Grumel (1958: 144) follows Dulaurier (1859: 101, 406) in believing that the Armenian Christian year must have been fixed as beginning from Epiphany (6 January). Such seems to have been the case for Samuel of Ani. As the continuator of Eusebius exhibiting parallel columns of numbers, Samuel had to use a fixed year. He fixed the Christian year 1 as beginning at Epiphany of Olympiad 194.4, corresponding to 6 January, AD 1. His chronicle begins with Olympiad 195.1, corresponding to AD 1/2, and including the Armenian Christian years 1 and 2. He does not allow the Armenian year to fall back with respect either to the Christian year or to the Olympiads. The Armenian year 1 is aligned with Olympiad 333.1 and the Christian year 554. At the end of the chronicle 625 years later, the Armenian year 626 is aligned with

Olympiad 489.2 and the Christian year 1179. With the Christian year 1 beginning in January of AD 1 and the Christian year 554 in January of AD 554, Samuel's system is not in fact two years ahead of the Dionysian common era, but identical with it. It is his Armenian era that is at variance with the system. Samuel seems to have synchronized the Armenian year with the Christian year. The Armenian year 1 begins in January 553, instead of July 552. The year 554 appears in the chronological apparatus as aligned with Olympiad 333.1, 553/554, because the year 554 began in January of that Olympiad year.

It does not follow from Samuel's usage that other authors also synchronized the Armenian Christian year with the liturgical year beginning at Epiphany. To use an Armenian era that was 'mobile' with respect to the Roman calendar and a Christian era that was fixed would make for an awkward system.

The evidence can be unified on the hypothesis that the tradition synchronized the year 553 from Christ with the Armenian civil year beginning on 1 Navasard = 11 July AD 552 and allowed the numbered year from Christ to move with respect to the Roman calendar in conjunction with the civil year. Thus the year 553 began 11 July AD 552 and included the Paschal full moon of 13 April AD 553. The tenth year of the Armenian era began 9 July AD 561 and included the Paschal full moon of 4 April AD 562. The texts that associate the year 553 with the year 1 of the Armenian era do so correctly. The texts that date by reference to the Armenian era with a base date corresponding to 11 July AD 552 also do so correctly. The Armenian year 1 is correctly reported as being the first year of a bissextile cycle. The year 551/2 was a leap year.

i. Years from Christ in Armenian texts

Apart from those texts that associate the establishment of the Armenian era with the year 553 from Christ and a few later authors who adopted Samuel's apparent equation of the Armenian year 1 with the Christian year 554, the use of years numbered from Christ is rare in Armenian sources. When such dates do appear, they are almost always in conjunction with a numbered year of the Armenian era and usually with the equation Armenian 1 = Christ 553.

Among earlier authors, only Stepanos of Taron uses an interval counted from Christ. He dates the second restoration of the Armenian monarchy to the Christian year 888, Armenian year 336 (Dulaurier 1859: 267). The synchronism is consistent with his statement that the Armenian era began in the year 553 since Christ (Dulaurier 1859: 174). Tovma Artzruni sometimes dates by reference to the Armenian era, but never in conjunction with a count of the years since Christ (Brosset 1874: 95 n. 4). Movses Kaghankatvatsi (p. 3 Dowsett) dates by regnal years and by reference to the Armenian era. Only once does he give an interval from the birth of Christ. At the beginning of his work, Movses says that the Parthians ruled Persia for 252 years before the coming of Christ. Inscriptional evidence shows that the Parthians counted their year 1 from a date corresponding to 247 BC.[4] The historian Justinus (41. 4), however, dates the Parthian rebellion to the time of the first Punic war, when Lucius Manlius Vulso and Marcus Attilius Regulus were consuls, 256 BC. We do not know how Movses dated Parthian rule, and the interval of 252 years before Christ therefore does not tell us how he dated the Nativity. Elsewhere (p. 206 Dowsett), Movses says there is an interval of 400 years from the Ascension to the time of Juvenal (bishop of Jerusalem, *c.*422–58). The interval is approximately correct, but again leads to no conclusion about the use of a Christian era.

Timothy Greenwood (2003*a*) has translated 100 Armenian colophons of the tenth and eleventh centuries, numbered from 42 to 141 corresponding to the published Armenian edition of these texts. Of these, only two number years from the birth of Christ and a third gives an interval from the crucifixion. I have reproduced one of these texts (#110) in Ch. 12. The Catholicos Petros Getadardz subscribes a translation of the homilies of John Chrysostom in the 13th year of an Indiction, during the reign of the emperor Monomachus, the year 495 of the Armenian era, 744 from the Illumination, and 1045 from the Nativity. One of these numerals must be an error. The year 495 of the Armenian era began on 1 Navasard = 10 March AD 1046. The 13th year of an Indiction during the appropriate period corresponds to 1044/5. It is only the number of the Armenian year that is inconsistent with the other dates. Stepanos of Taron synchronizes the Armenian year 1 with the year 252 from Gregory the Illuminator. Another colophon equates 734 from the Illumination with 483 of the Armenian era, which is consistent with Stepanos's numbering. Therefore 744 from the Illumination should be the Armenian year 493, which began in March 1044. The numeral 495 in the text should be corrected to 493. By the equation Armenian 1 = Christ 553, that would have been the year 1045 from the Nativity. During that Armenian year a 13th indictional year began on 1 September AD 1044. Dulaurier (1859: 267, 289, 298) suggested that 1045 might be a scribal error for 1047, the confusion of the symbols for 5 and 7 being frequent (he says) in Armenian manuscripts. It is true that the characters for 5 (Ե) and 7 (Է) look very much alike, but it is clearly the number of the Armenian era that is erroneous. By my hypothesis,

[4] Ginzel 1906–14: i. 137–8; Bickerman 1943.

the Armenian Christian year 1045 began on 1 Navasard = 10 March AD 1044, consistent with a 13th indictional year beginning 1 September 1044.

Another colophon (#129) is dated to the cosmic year 6501, 1077 from Christ, and 525 of the Armenian era, thus attesting to the equation between Armenian 1 and the Armenian Christian year 553. Cosmic eras vary widely in Armenian sources (see Ch. 12). The one most commonly used is within a year or two of Hovhannes Kozern's synchronism between the year 5976 and the beginning of the Armenian era. The equation in this text of 6501 with Armenian 525 yields 5977 for the Armenian year 1, clearly a variant of Kozern's calculation.

The third example (#100) synchronizes Armenian 483 with 734 of the Illumination, 1003 from the crucifixion, 6354 from Adam. If the author thought of the Crucifixion as having occurred in the 33rd year of Christ, then the Armenian year 483 would correspond to 1035 from Christ, again attesting to the interval of 552 between the Armenian era and years numbered from Christ. The designation of the year as 734 from the Illumination is consistent with Stepanos of Taron's interval of 301 years between the epoch of Gregory and the birth of Christ.

Of 52 inscriptions from the same period for which Greenwood (2003*b*) has also provided translations, only two equate an Armenian year with a year from Christ. One (*CIArm* I, #101) records the decoration of the cathedral church at Ani by Queen Katranide in the Armenian year 450, 219 of the era of the Romans, 402 of the Muslim era of the Hijra. At the end of the inscription, the Catholicos Sergius orders commemorative prayers for the now deceased queen, designating the year as 1012 from the Incarnation, 718 from the conversion of Armenia to Christianity, 6433 from Adam. The Armenian year 450 began in AD 1001. The Armenian year 1 corresponded to the year 305 of the era of the Romans (see Ch. 12). The year 219 of that era is presumably equivalent to $532 + 219 = 751$, which would be the Armenian year 447. Samuel of Ani (*PG* 19. 723) commemorates the queen's decoration of the cathedral in a note that begins at the Armenian year 457 and spans several lines. In the note at the end of the inscription, the 718th year from St Gregory should be the Armenian year 467, but the year 6433 from Adam should be within a year or two of the Armenian year 457. The designation of the year at the beginning of the inscription as 402 from the Hijra does not help. That year in the Muslim lunar calendar began 4 August 1011, corresponding to 19 Kaghots in the Armenian year 460. That date would agree with the Armenian Christian year 1012, but Hijra 402 is the date of the queen's decoration. We do not know how much time elapsed between that occasion and the memorial prayers that Sergius dates to 1012. The numerals are too inconsistent to permit any conclusion as to how Sergius came to number the year as 1012 from Christ—if that number is correct.

The other example is a dedication at the church of St George at Horomos by King Smbat, son of Gagik.[5] It is dated to the Armenian year 485, the 1616th *lempiad* from creation, and the 260th *lempiad* from the Incarnation. The Armenian year 485 began 12 March AD 1036. By my hypothesis, it would have counted as the year 1037 from Christ. A *lempiad* or 'Olympiad' in Armenian texts is a four-year period counted from one terminus or another. Thus the first year of the 1616th Olympiad from Adam would be 6461. The synchronism of 6461 with Armenian 485 is consistent with 6501 = 525 in the colophon mentioned above and implies the Christian year 1037. The first year of the 260th Olympiad from the Incarnation is also the year 1037. The inscription therefore attests to the same interval of 552 between years of Christ and years of the Armenian era.

In an 'Anthologie chronologique', Dulaurier (1859: 193–351) collected a selection of a hundred texts that he considered especially significant for Armenian chronology or chronography. Only twelve give a date expressed in years from Christ. The first (Dulaurier 1859: 193) is an excerpt from Samuel of Ani (*PG* 19. 665), dating the death of Constantine to 22 May, aligned with Olympiad 280.2 and the year 343 since Christ. The correct date is 22 May 337.[6] Samuel's chronicle was a continuation of that of Eusebius. The *Chronicle* of Eusebius ended at the 20th year of Constantine. Eusebius synchronized the first year of Constantine with Olympiad 271.3 and said that he ruled for 30 years and 10 months (p. 229 Helm). Samuel enters his first year at Olympiad 272.1 and gives him 34 years of rule. Samuel disagrees with Eusebius in the number of years assigned to several of the Roman emperors, beginning with Nero. Why he gives Constantine as many as 34 years, we do not know.

Dulaurier's second example (1859: 201) is from an Armenian translation of an introduction to the letters of St Paul. It dates the Apostle's martyrdom 36 years after the Passion, 69 years after the Nativity, 330 years before the first consulship of the emperor Arcadius, Indiction 9. The numbers are identical with those in the Euthalian text discussed in Ch. 14, deriving ultimately from Eusebius.

Of the remaining ten examples, I have already mentioned three: two of the colophons and the passage of Stepanos of Taron synchronizing the Christian

[5] There is a typographical error in Greenwood's translation (2003*b*, #40) as it was posted on the internet, giving the Armenian year as 465; Mahé (2002: 172–3) translates the numeral in the inscription as 485.

[6] *Consularia Constantinopolitana*, Mommsen 1892: 235.

year 888 with the Armenian year 336. The other seven all date from the end of the twelfth century or later, as follows.

1. A preface to the work of the physician Mkhitar of Her states that the book was written in the year 1184 since Christ, 633 of the Armenian era (Dulaurier 1859: 325). The year 633 in the Armenian mobile calendar began 4 February AD 1184. By my hypothesis, that should have been numbered as the year 1185 from Christ. Western influence may well account for the Dionysian date of 1184.

2–3. Two passages from Kirakos included in Dulaurier's collection are consistent neither with each other nor with the same author's statement associating the Christian year 553 with the Armenian year 1. In one of these passages, Kirakos dates Muhammad to the Christian year 618, the Armenian year 67, an interval of 551 instead of 552 years (p. 50 Bedrosian). In the other, Kirakos dates the construction of the Church of St Gregory to the Christian year 1000 = Armenian 447, an interval of 553 years (p. 80 Bedrosian).

4. Mkhitar of Airivank dates the martyrdom of Sahag and Joseph to the year 6000 since Adam, 802 from Christ, 249 of the Armenian era. Elsewhere, Mkhitar attests to the tradition that the Armenian era was established in the year 553 (Dulaurier 1859: 65, 252). He seems to have added 553 to 249, instead of correctly recognizing the interval as 552.

5. A text included in an Armenian anthology reports the rediscovery of the relics of St Nerses in the year 1275 since the birth of Christ, 968 since St Gregory, the year 872 since the death of Nerses, and 721 of the Armenian era (Dulaurier 1859: 344). The numerals are not internally consistent. By Stepanos of Taron's numbers, the year 968 since Gregory should be Armenian year 717 and Christian year 1269. We cannot be sure that the numbers 721 and 1275 are correctly reported.

6. A subscription to the work of Michael the Syrian states the book was translated from Syriac into Armenian during the course of the year 1248 from the Nativity, 695 of the Armenian era (Dulaurier 1859: 332). The interval of 553 years may reflect the influence of Samuel.

7. The subscription to the work of Stepanos Orbelian uses the date 1299 since Christ and a set of calculations equivalent to year 746 of the Armenian era—again Samuel's interval (Dulaurier 1859: 345).

The evidence is meagre and inconsistent, the numerals sometimes corrupt or otherwise mistaken. For the earlier period, however, such evidence as there is supports the hypothesis that the tradition synchronized the Armenian year 1 with the year 553 from Christ and calculated years from the Incarnation only in relation to the Armenian era. In the later period, Samuel's interval of 553 years became influential.

ii. The Source of the Year 553

A Christian year 553 beginning at a date corresponding to 11 July of AD 552 is about six months in advance of the Dionysian Christian era as coordinated with the Roman civil calendar, about three months later than the Christian era of Julius Africanus as coordinated with a natural year beginning 25 March, and approximately six weeks earlier than the year 5501 of Africanus as coordinated with the Alexandrian or Byzantine civil year. All entail the same date for the Nativity on 25 December of 1 BC or, in the eastern tradition, 6 January of AD 1.

The consistency with which the tradition associates the year 553 with the end of the 200-year Paschal list of Andreas and the beginning of the Armenian year 1—and the rarity of numbered years from Christ in other texts—suggests that the number 553 was somehow embedded within the work of Andreas. Kozern's formulation is the most accurate—there are 552 years from the birth of Christ to the Armenian era. That is, the 200 year list of Andreas ended with the Paschal full moon of 25 March in the year 552, and the Armenian year 1 was numbered as the equivalent of 553.

Andreas might have numbered his list from 353 to 552, using the Christian era of Julius Africanus and the Alexandrian or Byzantine civil year beginning in September of 352. More likely, he simply numbered the list from 1 to 200, stating in the preface that the first year was the 353rd from Christ and indicating how it corresponded to such chronological standards as the Roman consular year and the emerging Alexandrian practice of numbering years from Diocletian. The Armenians therefore knew that the year 201 was the year 553 from Christ.

4. THE PREFACE OF THE ATHANASIAN 95-YEAR LIST

The preface of the Latin version of a 95-year table included in a seventh-century Paris manuscript (van de Vyver 1957) contains just such a synchronism between years from Christ and the numbered years of the table. I discussed this document in Ch. 8 and labelled it as '*P*'.

P covers five 19-year cycles numbered by the years of Diocletian from 145 to 239, corresponding to AD 429 to 523. It lists only the dates for Easter Sunday and the age of the moon as of that date. From this information, the dates for the Paschal full moon can be inferred. Each 19-year cycle begins with a 14th day of the moon on 4 April and ends with 15 April. The intervening dates are identical to those of the classical Alexandrian cycle except that in the 9th year the cycle produces 6 April, instead of 5 April.

I suggested in Ch. 9 the possibility that *P* is a continuation of a 95-year list drafted by Athanasius in connection with the Council of Sardica. Athanasius changed the Anatolian dates of 26 March and 14 April to 25 March and 13 April as part of a compromise with the Roman church.

P presents the 19-year cycle in exactly the form that the Armenian tradition represents as being the genuine cycle of the Fathers preserved by Andreas. It has the date of 6 April that the Armenians defended into modern times. It also has the dates of 25 March followed by 13 April that the Armenians say Andreas exhibited. Thus Andreas in his continuation of the tables of Anatolius adopted the revisions of Athanasius. The preface of *P* attributes the cycle to Dionysius of Alexandria. The Armenian Catholicos Petros in the colophon to his translation of Chrysostom also attributed the genuine 19-year cycle to Dionysius, albeit without adding that he was an Alexandrian (Greenwood 2003*a*: #100).

P exhibits a 95-year list of Easters numbered by the years of Diocletian from 145 to 239. The preface, however, refers to a list originally beginning 95 years earlier in the 50th year of Diocletian. It also synchronizes the 50th year of Diocletian with a numbered year from Christ. I provided a translation of this text in Ch. 9. Here I reproduce only the relevant portion:

> Here begins the 19-year computation of Dionysius, bishop of Alexandria . . . In ninety-five years there are five courses of 19 (*XVIIII*). The beginning is the year 339 (*CCCXXXVIIII*) of the coming of Christ, in the fiftieth year of Diocletian.

The 50th year of Diocletian was AD 333/4. If that year was also the 339th from Christ, then the Nativity would have occurred in 6/5 BC—a date without parallel in the early Christian tradition. The numeral 339 in the text is most likely a corruption of 334. The translator might have misread *ΤΛΔ* in the Greek exemplar as *ΤΛΘ*. Or a copyist of the Latin text might have repeated the *XVIIII* from the previous numeral and written *CCCXXXVIIII*, instead of copying correctly *CCCXXXIIII* from the exemplar.

5. DIONYSIUS EXIGUUS AND THE CHRISTIAN ERA

The Christian era of Dionysius is no more than the cosmic year 5501 in the system of Julius Africanus, adapted first to the Alexandrian civil year, then to the Roman or indictional year. Anatolius adopted the Christian era of

Africanus and adjusted it to the Alexandrian calendar. He noted in his preface that the second 19-year cycle, the effective date of his reform, corresponded to the second year of Probus and the 277th year from Christ. From Anatolius that synchronism was carried forward and updated in the prefaces of Athanasius, Andreas, and Anania. It is a reasonable supposition that when Theophilus drafted a new version of the Athanasian tables beginning from the first consulship of Theodosius, he too transmitted the Christian era of Africanus and Anatolius. Indeed, the manuscripts of the extant Latin version of the prologue of Theophilus do in fact carry at the end what looks to be the heading of Theophilus' table:

> List of the Paschal years, with year 1 when Gratian and Theodosius were consuls, 1 March was Sunday, ninth day of the moon, the Paschal day was 12 April, the 21st day of the moon, in the year from the Incarnation of Christ 380, but according to the cycle of Victorius in the year 353. (Krusch 1938: 226, apparatus.)

The presence of Victorius' era of the Passion shows that the title cannot derive in its entirety from Theophilus. In addition, the weekday and the age of the moon have been adapted to the Roman calendar, but given as of 1 March, instead of 1 January as in most Roman tables. The two days share the same lunar epact, but not the same weekday. Thus, as Krusch concluded (1938: 87), this note is at least in part the work of a later scribe. Also, moon 21 on 12 April entails moon 14 on 5 April, whereas I have suggested that Theophilus might still have used the Anatolian and Athanasian date of 6 April. Even so, that the table of Theophilus should have carried a title indicating the year of its beginning as a numbered year from Christ, as well as the consular year, is just what one would expect. For Theophilus to have synchronized the consular year with a year numbered from Christ would be entirely fitting in the age of Theodosius.

I have argued in Ch. 10 that it was Annianus, working shortly after Theophilus had published his 100-year Paschal list, who first recalibrated the Alexandrian cycle so that its first year corresponded to the first year of Diocletian, AD 284/5, and 95 years later to the first consulship of Theodosius, 379/80. Annianus also generated a new Christian era, with the year corresponding to AD 9 numbered as 5501. Cyril of Alexandria adopted the new cycle, stating specifically that the first consulship of the younger Theodosius was the 119th year from Diocletian (AD 402/3) and 5th year of a cycle (Conybeare 1907: 215–21). On my hypothesis Cyril did not adopt the new Christian era of Annianus, but continued to transmit the traditional date that Theophilus used and Panodorus defended. As I pointed out in Ch. 12, the earliest evidence for the use of the Christian era of Annianus dates from about twenty-five years after Dionysius Exiguus completed his work, in the monastic biographies written by Cyril of Scythopolis (*Vita Sabae* 77, p. 183). It was not until the seventh century that St Maximus Confessor (*PG* 19. 1243, 1249) could attest to this Christian era as 'established ecclesiastical tradition'.

Cyril of Alexandria or someone on his staff adapted the new cycle of Annianus for use in the Latin churches and published the 95-year table beginning in the 153rd year from Diocletian that Dionysius Exiguus continued. The prologue of Theophilus probably circulated along with the Cyrillan table. From that prologue Dionysius paraphrased some of the rules for the observance of Easter. From the same source Dionysius also had a synchronism between years from Christ and either years of Diocletian or consular years.

Antoine Pagi (1689: iv, xxxviii) had the right solution to the 'Dionysian problem' after all. Dionysius Exiguus did not calculate or otherwise invent a new Christian era. He simply transmitted to the west a well-established tradition of the Alexandrian church. Pagi said that Dionysius had adopted both the era of the Incarnation *and* the Paschal calculations of Alexandria. It is rather the case that Dionysius adopted his era of the Incarnation from the Alexandrians *with* their 19-year Paschal cycle. It was the Christian era of Julius Africanus, adopted by Anatolius of Laodicea, and transmitted along with the 19-year cycle to Athanasius, Andreas, Theophilus, Panodorus, and the Armenian church, as well as to Dionysius Exiguus.

This page intentionally left blank

References

1. ANCIENT AND MEDIEVAL TEXTS

Abraham Bar Hiyya. *Sefer Ha-Ibbur*, ed. Herschell Filipowski (London: Longman, Brown, Green, and Longmans, 1851).

Aelius Aristides. *Aelii Aristidis Smyrnaei quae supersunt omnia,* ed. Bruno Keil, *Vol. II, Orationes XVII–LIII continens* (Berlin: Weidmann, 1898); cited, as is the scholarly custom, by the pagination of the edition of Samuel Jebb (Oxford, 1722–30).

Africanus. *See* Julius Africanus.

Agathias. *See* Cameron 1969.

Al-Biruni. *The Chronology of Ancient Nations,* ed. C. Edward Sachau (London: W. H. Allen, 1879).

Aldhelm. *Aldhelmi Opera*, ed. Rudolf Ehwald (*MGH*, Auctores antiquissimi, 15; Berlin: Weidmann, 1919).

Ambrose. *De Fide*, ed. Otto Faller, *Sancti Ambrosi opera. Pars octava* (CSEL 78; Vienna: Tempsky, 1962).

—— *De Noe et Arca*, ed. C. Schenkl, *Sancti Ambrosi opera. Pars prima* (CSEL 32; Vienna: Tempsky, 1897).

—— *Letter on the Date of Easter (Extra Collectionem* 13) ed. Michaela Zelzer, *Sancti Ambrosi opera. Pars decima* (CSEL 82; Vienna: Österreichische Akademie der Wissenschaften, 1996).

Ammianus Marcellinus. *Ammiani Marcellini Rerum gestarum libri qui supersunt*, ed. Wolfgang Seyfarth, Liselotte Jacob-Karau, and Ilse Ulmann (Leipzig: Teubner, 1978).

Anania of Shirak. Preface to the Easter table. *See* Conybeare 1897.

—— 532-year perpetual calendar. *Anania Shirakats'i: Matenagrut'yun*, ed. A. G. Abrahamyan and G. B. Petrosyan (Erevan: Sovetakan Grogh Hratarakch'ut'yun, 1979), 174–249.

Anglo-Saxon Chronicle. *See* Whitelock 1961.

Apostolic Constitutions. *Les Constitutions apostoliques*, ed. Marcel Metzger, 3 vols. (Paris: Éditions du Cerf, 1985–7).

Arabic Gospel of the Infancy of the Saviour. *Evangelium infantiae salvatoris Arabicum*, ed. Constantin von Tischendorf, *Evangelia Apocrypha,* 2nd edn. (Leipzig: Mendelssohn, 1876), 181–209; tr. Alexander Walker, *Ante-Nicene Christian Library*, ed. Alexander Roberts and James Donaldson, xvi (Edinburgh: T. & T. Clark, 1870), 100–24, repr. *Ante-Nicene Fathers*, viii (Buffalo, New York: The Christian Literature Publishing Company, 1886), 405–15.

Aristakes Lastiverttsi. *History Regarding the Sufferings Occasioned by Foreign Peoples Living Around Us*, translated by Robert Bedrosian (New York: Sources of the Armenian Tradition, 1985; published electronically at http://rbedrosian.com/alint.htm).

Aristophanes. *Aristophanis Fabulae*, ed. Nigel Wilson, 2 vols. (Oxford: Clarendon Press, 2007.

—— *Scholia Vetera in Aristophanis Aves*, ed. D. Holwerda (Groningen: Bouma, 1991).

Aristotle. *Metaphysics*, ed. W. D. Ross, 2 vols. (Oxford: Clarendon Press, 1958).

Arrian. *Alexandri Anabasis*, ed. A. G. Roos (Leipzig: Teubner, 1967).

Astronomical Canon, ed. H. Usener in Mommsen 1898: 438–55.

Athanasius. *The Festal Letters of Athanasius*, ed. William Cureton (London: Society for the Publication of Oriental Texts, 1848). English tr. Henry Burgess, *The Festal Epistles of S. Athanasius, Bishop of Alexandria* (Oxford: J. H. Parker, 1854). A revised version of this translation was published by Archibald Robinson, *LNPNF*, Series Two, vol. 4 (1891), 502–53. The best modern edition, taking account of all the evidence, is the annotated Italian translation of Alberto Camplani (2003).

—— Athanasian Index: *Histoire 'acéphale' et index syriaque des Lettres festales d'Athanase d'Alexandrie*, ed. Annik Martin and Micheline Albert (Paris: Éditions du Cerf, 1985).

—— Defence against the Arians: *Apologia contra Arianos sive Apologia secunda*, ed. Hans-Georg Opitz, *Athanasius Werke*, ii/1: 87–168 (Berlin: Walter de Gruyter, 1940).

—— History of the Arians: *Historia Arianorum*, ed. Hans-Georg Opitz, *Athanasius Werke*, ii/1: 183–230.

—— On the Synods: *De Synodis*, ed. Hans-Georg Opitz, *Athanasius Werke*, ii/1: 231–78.

Augustine. *De civitate Dei*, ed. Bernhard Dombart and Alfonsus Kalb (Leipzig: Teubner, 1928–9).

—— *In Iohannis evangelium tractatus CXXIV*, ed. R. Willems (Corpus Christianorum, Series Latina, 36; Turnhout: Brepols, 1954).

Augustus. *Res Gestae Divi Augusti: The Achievements of the Divine Augustus*, edited and translated by P. A. Brunt and J. A. Moore (Oxford: Oxford University Press, 1967).

Bar-Hebraeus. *The Chronography of Gregory Abû'l Faraj, the Son of Aaron, the Hebrew Physician, Commonly Known as Bar Hebraeus*, translated from the Syriac by Ernest A. Wallis Budge (Oxford: Oxford University Press 1932).

Basil of Caesarea. *Basile de Césarée. Homélies sur l'hexaéméron*, ed. S. Giet (Paris: Éditions du Cerf, 1968).

Bede, *DTR.* = *de Temporum Ratione, See* Jones 1943 and 1977. English tr. Wallis 1999.

—— *HE* = *Bede's Ecclesiastical History of the English People*; ed. Bertram Colgrave and R. A. B. Mynors (Oxford: Clarendon Press, 1969, 1992).

Byzantine Synaxarium. *Synaxarium Ecclesiae Constantinopoleos*, ed. H. Delehaye (Acta Sanctorum, 62; Paris: V. Palmé, 1902).

Cassiodorus. *Chronicle*, ed. Mommsen 1894: 109–61.

—— *Computus Paschalis*, ed. Pallarès 1994.

—— *Chronicle, Institutiones*, ed. R. A. B. Mynors (Oxford: Clarendon Press, 1961).

Cassius Dio. *Cassii Dionis Cocceiani historiarum Romanarum quae supersunt*, ed. U. P. Boissevain, 3 vols. (Berlin: Weidmann, 1895–1901).

Censorinus. *De die natali liber*, ed. Nicolaus Sallmann (Leipzig: Teubner, 1983).
Chronicle of Edessa, ed. B. H. Cowper, *The Journal of Sacred Literature*, 5 (1864), 28–45.
Chronicon Paschale. *Chronicon Alexandrinum idemque astronomicum et ecclesiasticum*, ed. Matthäus Rader (Munich: Ex formis Annæ Bergiæ viduæ, 1615).
—— *Paschalion, seu, Chronicon Paschale a mundo condito ad Heraclii Imperatoris annum vicesimum*, ed. Charles du Cange (Paris: E typographia regia, 1688).
—— *Chronicon Paschale. Ad exemplar vaticanum recensuit Ludovicus Dindorfius* (CSHB, 2 vols. Bonn: Weber, 1832).
Chronograph of 354, ed. Mommsen 1892: 13–148.
Cicero. *Brutus (de Oratore*), ed. A. E. Douglas (Oxford: Clarendon Press, 1966).
Claudius Ptolemy. *Almagest (Syntaxis Mathematica): Claudii Ptolemaei Opera quae exstant omnia*, ed. J. L. Heiberg, i/1–2 (Leipzig: Teubner, 1898–1903).
Clement of Alexandria. *Stromata*, ed. Otto Stählin, 3rd edn. revised by Ludwig Früchtel (Berlin: Akademie Verlag, 1960).
Codinus. Pseudo-Codinus, *Patria Constantinopoleos*, ed. T. Preger, *Scriptores originum Constantinopolitanarum*, pt. 2: 135–289 (Leipzig: Teubner, 1907).
Cologne Mani-Codex. *Der Kölner Mani-Kodex: Über das Werden seines Leibes*, herausgegeben und übersetzt von Ludwig Koenen und Cornelia Römer (Opladen: Westdeutscher Verlag, 1988).
Columban. *Sancti Columbani Opera,* ed. G. S. M. Walker (Dublin: Institute for Advanced Studies, 1957).
Columella. *De re rustica*, ed. Harrison Boyd Ash (Cambridge, MA: Harvard University Press, 1960–79).
Computist of 243. *Cypriani de Pascha computus*, ed. Johannes Wallis, in *Sancti Caecilii Cypriani Opera recognita et illustrata per Johannem Oxoniensem Episcopum* [John Fell] (Oxford: E Theatro Sheldoniano, 1682; repr. *PL* 4. 942–72); English tr. Ogg 1955.
Computist of 455, ed. Giovan Domenico Mansi, *Stephani Baluzii Tutelensis Miscellanea: novo ordine digesta et non paucis ineditis monumentis opportunisque animadversionibus aucta* (4 vols., Lucca: apud V. Junctinium, 1761–4), i: 414–19, repr. PL 59. 545–60; ed. Bruno Krusch 1880, 279–97.
Concilia aevi Merovingici 511–695, ed. Friedrich Maasen (*MGH*, Legum Sectio III Concilia, 1; Hannover: Hahn, 1893).
Concilium universale Chalcedonense, ed. E. Schwartz, 6 vols. (Berlin: Walter de Gruyter, 1932–8).
Coptic Synaxarium. *Synaxarium Alexandrinum*, ed. J. Forget, 2 vols. (Beirut: E Typografeo Catholico, 1905); English tr. 4 vols. (Chicago: St. George Coptic Orthodox Church, 1987–1995); cited from the pagination of the electronic edition at http://www.copticcentre.com/synaxarium.pdf, accessed 15 Oct. 2007.
Cyril of Alexandria. Letter to Theodosius on Easter, ed. Conybeare 1907.
Cyril of Scythopolis. *Kyrillos von Skythopolis*, ed. Eduard Schwartz (Leipzig: J. C. Hinrichs, 1939).

Didascalia Apostolorum. Didascalia apostolorum; the Syriac version translated and accompanied by the Verona Latin fragments, with an introduction and notes by R. Hugh Connolly (Oxford: Clarendon Press, 1929).

Diodorus of Sicily. *Diodori Bibliotheca historica* ed. K. T. Fischer and Fr. Vogel, 5 vols. (Leipzig: Teubner 1906).

Dionysius of Alexandria. *Dionysius von Alexandria: Das erhaltene Werk.* Eingeleitet, übersetzt, und mit Anmerkungen versehen von Wolfgang A. Bienert (Stuttgart: A. Hiersemann, 1972).

Dionysius Exiguus. *Die Canonessammlung des Dionysius Exiguus in der ersten Redaktion*, ed. Adolf Strewe (Berlin: Walter de Gruyter, 1931).

—— *Dionisii Exigui praefationes,* ed. F. Glorie, *Scriptores Illyrici minores* (Turnhout: Brepols, 1972).

—— *Liber de Paschate. Epistulae Duae de Paschate*, ed. J. Wilhelm Jan (Wittenburg 1718, repr. *PL* 67: 453–520); ed. Bruno Krusch 1938: 59–87.

Dionysius of Halicarnassus. *Dionysii Halicarnasei antiquitatum Romanarum quae supersunt*, ed. K. Jacoby, 4 vols. (Leipzig: Teubner, 1885–1905).

Dionysius of Tel-Mahre. *Eusebii canonum epitome*, ed. C. Siegfried, H. Gelzer (Leipzig: Teubner, 1884); English tr. Witakowski 1996.

Durand, Guillaume. *Guillelmi Duranti Rationale divinorum officiorum*, ed. A. Davril and T. M. Thibodeau, 3 vols. (Turnhout: Brepols 1995–2000).

Ecclesiae Occidentalis Monumenta Iuris Antiquissima, ed. Cuthbert Turner, 2 vols. (Oxford: Clarendon Press, 1939).

Elias of Nisibis. *Eliae Metropolitae Nisibeni Opus chronologicum*, ed. I.-B. Chabot (Paris: C. Poussielgue, 1909).

Epiphanius. *Panarion*, ed. K. Holl, 3 vols. (Leipzig: J. C. Hinrich, 1915–1933); English tr. Frank Williams, *The Panarion of Epiphanius of Salamis*, 2 vols. (Leiden: E. J. Brill, 1987, 1994).

Eusebius. *Chronicle. Eusebii Pamphili Chronicorvm canonvm libri duo,* ed. Iohanne Zohrab, Angelo Mai (Milan: Regiis Typis, 1818); *Eusebi Chronicorum Libri Duo,* ed. Alfred Schoene, H. Petermann, E. Roediger (Berlin: Weidmann, vol. 1 1875, vol. 2 1866); *Die Chronik des Eusebius aus dem armenischen übersetz,* ed. Josef Karst (Leipzig: J. C. Hinrich, 1911); *Die Chronik des Hieronymus,* ed. Rudolf Helm (Berlin: Akademie Verlag 1926, 2nd edn. 1956, 3rd edn. (Ursula Treu) 1984.

—— *De solemnitate Paschali*, ed. Angelo Mai, *Novae Patrum bibliothecae*, vol. 4: 209–16 (Rome: Typis Sacri Consilii Propagando Christiano Nomini, 1847, repr. *PG* 24: 693–705).

—— *Demonstratio Euangelica*, ed. I.A. Heikel (Leipzig: J. C. Hinrichs, 1913).

—— *Excerpta Eusebiana*, ed. J. Cramer, *Anecdota graeca e codd. manuscriptis Bibliothecae regiae parisiensis*, vol. 2 (Oxford: E Typographeo academico, 1840).

—— *Historia Ecclesiastica,* ed. E. Schwartz, Th. Mommsen, *Die Kirchengeschichte*, 3 vols. (Leipzig: J. C. Hinrichs, 1903–8).

—— *Praeparatio Evangelica*, ed. K. Mras, 2 vols. (Berlin: Akademie Verlag, 1954–6).

—— *Vita Constantini*, ed. Friedhelm Winkelmann, *Über das Leben des Kaisers Konstantins*, 2nd edn. (Berlin: Akademie Verlag, 1991).

Euthalius. *See* Robinson 1895.

Eutychius. *Annales*, ed. E. Pococke (Oxford: H. Hall, 1658, repr. *PG* 111); ed. L. Cheikho (Beirut: E Typographeo Catholico, 1906).

Eutropius. *Breviarium*, ed. C. Santini (Leipzig: Teubner, 1979).

Evagrius Scholasticus. *The ecclesiastical history of Evagrius with the scholia*, ed. J. Bidez, L. Parmentier (London: Methuen, 1898).

Excerpta Barbari. Ed. Schoene 1866–75: i. 173–239; consular list ed. Mommsen 1892: 274–98.

Fasti Capitolini. *See* Degrassi 1954.

Felix of Gillitanus. *Praefatio*, *PL* 129. 1331; Krusch 1880: 207.

Flavius Josephus. *Flavii Iosephi opera*, ed. B. Niese, 4 vols. (Berlin: Weidmann, 1887–1890).

Geminus. *Elementa astronomiae*, ed. C. Manitius (Leipzig: Teubner, 1898).

Gennadius. *Hieronymus und Gennadius: De viris inlustribus*, ed. Carl Albrecht Bernoulli (Leipzig: Mohr, 1895).

George the Monk. *See* Diekamp 1900.

George Cedrenus, ed. I. Bekker, *CSHB*, 2 vols. (Bonn: Weber, 1838–9).

George Syncellus. *Ecloga Chronographica Georgii Syncelli*, ed. A.A. Mosshammer (Leipzig: Teubner, 1984); English tr., *see* Adler and Tuffin 2002.

Ghevond Yerets. Translated by Robert Bedrosian; published electronically at http://rbedrosian.com/ghewint.htm, accessed 15 September 2007.

Glaber. *Rodulfi Glabri Historiarum libri quinque*, edited and translated by John France (Oxford: Clarendon Press 1989).

Gregory of Nazianzus. *In sanctum Pascha*, ed. Armand Caillau, *Sancti Patris Nostri Gregorii Theologi, vulgo Nazianzeni, Opera omnia* (Paris: P. Mellier 1842), repr. *PG* 36. 624–64.

Gregory of Nyssa. *In Basilium Fratrem*, ed. O. Lendle, *Gregorii Nysseni Opera*, x/1 (Leiden: E. J. Brill, 1990), 109–34.

Hermodorus. *On Plato*. fragments ed. F. Lasserre, *De Léodamas de Thasos à Philippe d'Oponte*, 217–23 (Naples: Bibliopolis, 1987).

Herodotus. *Historiae*, ed. C. Hude, 2 vols. (Oxford: Clarendon Press, 1927).

Hippolytus. *Canon Paschalis*, ed. J. Fabricius, *S. Hippolyti episcopi et martyris Opera* (Hamburg: Chr. Liebezeit, 1718, repr. *PG* 10. 875–83).

—— *Die Chronik des Hippolytus in Matritensis Graecus 121 (Anonymi Chronographia syntomos e codice Matritensi no. 121)*, ed. Adolf Bauer (Leipzig: Teubner, 1905).

—— Fragments on Genesis, ed. Hans Achelis, *Hippolytus Werke*, i: *Exegetische und homiletische Schriften* (Leipzig: J. C. Hinrichs, 1897).

—— Hippolyte, Commentaire sur Daniel, ed. M. Lefèvre (Paris: Éditions du Cerf, 1947).

Historia Augusta. The Scriptores Historiae Augustae with an English Translation, ed. David Magie, 3 vols. (Cambridge, MA: Harvard University Press, 1921).

Irenaeus. *Sancti Irenaei episcopi Lugdunensis libri quinque adversus haereses*, ed. W. W. Harvey, 2 vols. (Cambridge: Typis Academicis, 1857).

Jerome. Chronicle, see Eusebius.

—— *Commentariorum in Danielem libri iii (iv)*, ed. F. Glorie, *S. Hieronymi Presbyteri Opera, Opera Exegetica*, v (Turnhout: Brepols, 1964).

—— *de viris illustribus*, see Gennadius.

John Catholicos. *Yovhannes Drasxanakertsi*, *History of Armenia*, translation and commentary by Krikor H. Maksoudian (Atlanta, GA: Scholars Press, 1987).

John Chrysostom. *In diem natalem*, ed. Bernard de Montfaucon (Paris 1731–8, repr. *PG* 49. 351–62).

John Malalas. *Chronographia*, ed. J. Thurn (Berlin: Walter de Gruyter, 2000).

Jordanes. *Iordanis Romana et Getica*, ed. Theodor Mommsen, *MGH*, Auctores antiquissimi, 5/1; Berlin: Weidmann, 1882).

Jubilees. Ed. R. H. Charles, *Apocrypha and Pseudepigrapha of the Old Testament* (Oxford: Clarendon Press, 1913), 1–82.

Julius Africanus. *See* Vieillefond 1970, Wallraff 2007.

Justinian Code. *Corpus Iuris Civilis*, ed. Th. Mommsen, P. Krueger, R. Schöll, W. Kroll, 3 vols. (Berlin: Weidmann, 1893–5).

Justinus. *Epitoma historiarum Philippicarum Pompei Trogi*, ed. Otto Seel (Stuttgart: Teubner, 1972).

Justin Martyr. *Die Apologien Justins des Märtyrers*, ed. Gustav Krüger (Tübingen: Mohr, 1915).

Kirakos of Gandzak. *Kirakos Ganjakets'i's History of the Armenians,* translated by Robert Bedrosian (New York: Sources of the Armenian Tradition, 1986); published electronically at http://rbedrosian.com/kg1.htm, accessed 15 September 2007.

Lactantius. *De Mortibus Persecutorum*, ed. J. L. Creed (Oxford: Clarendon Press, 1984).

Leo I of Rome. Letters, ed. E. Schwartz, *Acta Conciliorum Oecumenicorum,* ii/4 (Berlin: Walter de Gruyter, 1932); letters on Easter, ed. Bruno Krusch 1880: 251–65.

Leontius of Byzantium. *Contra Nestorium*, ed. Angelo Mai, *Novae Patrum bibliothecae*, vol. 2 (Rome: Typis Sacri Consilii Propagando Christiano Nomini, 1844, repr. *PG* 86. 1267–1396).

Liber Pontificalis, ed. L. Duchesne (Paris E. Thorin, 1886–92).

Livy. *Titi Livi Ab Urbe Condita*, ed. R. S. Conway et al., 5 vols. (Oxford: Clarendon Press, 1920–99).

Macrobius. *Saturnalia*, ed. J. Willis (Leipzig: Teubner, 1970).

Maimonides. *The Code of Maimonides [Mishneh Torah]*, tr. Jacob J. Rabinowitz (New Haven, Connecticut: Yale University Press, 1949).

Marcellinus Comes. *Chronicon*, ed. Mommsen 1894: 37–108.

Martyrium Pionii. Ed. Musurillo 1972: 137–67.

Martyrium Polycarpi. Ed. Musurillo 1972: 2–20.

Matthew Blastares. *Collectio alphabetica*, ed. M. Potles and G. A. Rhalles, *Σύνταγμα τῶν θείων καὶ ἱερῶν κανόνων τῶν τε ἁγίων καὶ πανευφήμων ἀποστόλων*, vi (Athens: *Ἐκ τοῦ Τυπογραφείου τῆς Αὐγῆς*, 1859).

Matthew of Edessa. *Armenia and the Crusades: Tenth to Twelfth Centuries; The Chronicle of Matthew of Edessa*, translated with a commentary and introduction by Ara Edmond Dostourian (Lanham, MD: University Press of America, 1993).

Maximus. *Computus Ecclesiasticus*, ed. Petau 1630, repr. *PG* 19. 1217–80.

Melito of Sardis. *On Pascha and Fragments*, ed. Stuart G. Hall (Oxford: Clarendon Press, 1979).

Michael the Syrian. *Chronique de Michel le Syrien, patriarche jacobite d'Antioche (1166–1199)*, ed. J.-B. Chabot, 5 vols. (Paris: E. Leroux, 1899–1910).

Movses Kaghankatvatsi. *The History of the Caucasian Albanians*, translated by C. J. F. Dowsett (Oxford: Oxford University Press, 1961).

Nicephorus Callistus. *Historia Ecclesiastica*, ed. Fronto Ducaeus (Paris: Sumptibus Sebastiani & Gabrielis Cramoisy, 1630), repr. *PG* 145–7.

Origen. *Die Homilien zu Lukas*, ed. Max Rauer, *Origenes Werke*, ix (Leipzig: J. C. Hinrichs:1959).

Orosius. *Histoires (contre les païens)*, ed. Marie-Pierre Arnaud-Lindet, 3 vols. (Paris: Belles Lettres, 1990–1).

Ovid. *P. Ovidi Nasonis Metamorphoses,* ed. R. J. Tarrant (Oxford: Clarendon Press, 2004).

—— *P. Ovidi Nasonis Tristia*, ed. John Barrie Hall (Stuttgart: Teubner: 1995).

Parian Marble, ed. Jacoby 1904 and in *FGrHist* no. 239, vol. 2B (Leiden, 1929), electronic edition at http://www.ashmolean.org/ash/faqs/q004, accessed 21 November 2007.

Paul of Alexandria. *Eisagogica elementa apotelesmatica*, ed. A. Boer (Leipzig: Teubner, 1958).

Photius. *Bibliothèque*, ed. René Henry, 9 vols. (Paris: Belles Lettres, 1959–91).

Pirkei Rabbi Eliezer. Pirke de Rabbi Eliezer, translated by Gerald Friedlander (New York: Bloch, 1916; 2nd edn., New York: Hermon Press, 1965).

Plato. *Platonis Opera*, ed. John Burnet, 5 vols. (Oxford: Clarendon Press, 1900–7).

Pliny the Elder. *Naturalis historiae libri XXXVII*, ed. Karl Mayhoff, 6 vols. (Leipzig: Teubner, 1870–1909).

Procopius. *Secret History. Procopii Caesariensis opera omnia*, ed. Jacobus Haury, 2nd edn. G. Wirth, iii (Leipzig, 1963); English tr. G. A Williamson, *Procopius: The Secret History* (Harmondsworth: Penguin Books, 1966).

Prosper of Aquitania. *Epitoma Chronicon*, ed. Mommsen 1892: 341–499.

Prudentius. *Aurelii Prudentii Clementis Carmina*, ed. M. Cunningham (Turnhout: Brepols, 1966).

Rufinus. Latin translation and continuation of the *Historia Ecclesiastica* of Eusebius, ed. Th. Mommsen in Eusebius, *Die Kirchengeschichte*, ed. E. Schwartz and Th. Mommsen (Leipzig: J. C. Hinrichs, 1903–8).

Sacrorum conciliorum nova et amplissima collectio, editio novissima, ed. J. D. Mansi, 36 vols. (Florence: Expensis Antonii Zatta, 1758–98, new edition Paris: H. Welter, 1901–27).

Samuel of Ani. *Summarium Temporum*, ed. with Latin translation J. Zohrab and Angelo Mai (Milan: Regiis Typis, 1818), repr. *PG* 19. 600–743; ed. with French translation and notes Brosset 1874, ii. 338–483.

Sextus Empiricus. *Aduersus mathematicos*, ed. J. Mau and H. Mutschmann, *Sexti Empirici opera*, vols. ii–iii (Leipzig: Teubner 1914, 2nd edn. 1961).

Socrates Scholasticus. *Sokrates: Kirchengeschichte*, ed. G. C. Hansen (Berlin: Akademie Verlag, 1995).

Solinus. *Collectanea rerum memorabilium*, ed. Th. Mommsen (Berlin: Weidmann, 1895).

Sozomen. *Kirchengeschichte*, ed. J. Bidez and G. C. Hansen (Berlin: Akademie Verlag, 1960).

Stepanos of Taron. *Histoire universelle*, tr. with notes E. Dulaurier (Paris: Leroux, 1883).

Stepanos Orbelian. *Histoire de Siounie*, tr. M. Brosset (St. Petersburg: Académie impériale des sciences, 1864).

Suda. *Suidae Lexicon*, ed. A. Adler, 4 vols. (Leipzig: Teubner, 1928–35); Greek texts with English tr. available through 'The Suda On Line', http://www.stoa.org/sol/, accessed 17 March 2008.

Suetonius. *De Vita Caesarum*, ed. M. Ihm (Leipzig: Teubner 1908).

Sulpicius Severus. *Chroniques: Sulpice Sévère*, ed. Ghislaine de Senneville-Grave (Paris: Éditions du Cerf, 1999).

Symeon the Logothete, ed. S. Wahlgren (Berlin: Walter de Gruyter, 2006), ed. I Bekker, *Leonis Grammatici chronographia*, *CSHB* (Bonn: Weber, 1842).

Syncellus. *See* George Syncellus.

Tacitus (*Annales*). *Cornelii Taciti Libri qui supersunt*, i/1 (1992), *Ab excessu divi Augusti libri I–VI*, ed. Stephanus Borzsák; i/2 (1986), *Ab excessu divi Augusti libri XI–XVI*, ed. Kenneth Wellesley (Stuttgart: Teubner, 1986–92).

Talmud. *Hebrew–English Edition of the Babylonian Talmud*, ed. I. Epstein, 30 vols. (London: Soncino Press, 1965–94).

Tertullian. *Adversus Iudaeos*, in *Quinti Septimi Florentis Tertulliani Opera*, ii, ed. E. Kroymann (Turnhout: Brepols, 1954).

Theodoret. *Historia Ecclesiastica*, ed. L. Parmentier (Leipzig: J. C. Hinrichs, 1911; 3rd edn. G. C. Hansen, Berlin: Akademie Verlag, 1998).

The Theodosian Code, ed. Jill Harries and Ian Wood (Ithaca, New York: Cornell University Press, 1993).

Theon of Alexandria. *Commentaires de Pappus et de Théon d'Alexandrie sur l'Almageste*, ed. A. Rome (Rome: Biblioteca Apostolica Vaticana, 1931–43).

—— *Le Petit Commentaire de Théon d'Alexandrie aux Tables faciles de Ptolémée*, ed. Anne Tihon (Rome: Biblioteca Apostolica Vaticana, 1978).

—— *Fasti Consulares*, ed. H. Usener, in Mommsen 1898: 359–81.

Theophanes Confessor. *Chronographia*, ed. C. de Boor (Leipzig: Teubner, 1883–5).

Theophilus of Alexandria. *Epistula ad Theodosium Augustum* and *De observatione sanctae paschae*, ed. Krusch 1880: 220–6.

Theophilus of Antioch. *Theophilus of Antioch. Ad Autolycum*, ed. R. M. Grant (Oxford: Clarendon Press, 1970).

Theophrastus. *Theophrasti Eresii opera quae supersunt omnia*, ed. F. Wimmer (Paris: Firmin-Didot, 1866).

Thucydides. *Historiae*, ed. H. S. Jones and J. E. Powell (Oxford: Clarendon Press, 1942).

Tibullus. *Albii Tibulli aliorumque carminum libri tres*, ed. F. W. Lenz (Leiden: E. J. Brill, 1964).

Tovma Artzruni, ed. Brosset 1874, i: 1–266.

Vardan Areveltsi. *The Historical Compilation of Vardan Arewelçi,* ed. Robert W. Thomson, *DOP* 43 (1989): 125–226.

Velleius Paterculus. *Vellei Paterculi Historiarum ad M. Vinicium Consulem libri duo*, ed. W.S. Watt (Stuttgart: Teubner, 1998).

Vettius Valens. *Vettii Valentis Antiocheni anthologiarum libri novem*, ed. D. Pingree (Leipzig: Teubner, 1986).

Victor of Tonnena. *Victoris Tunnunensis chronicon,* ed. Carmen Cardelle de Hartmann (Turnhout: Brepols, 2001); ed. Mommsen 1894: 178–206.

Victorius of Aquitania. *Cursus Paschalis*, ed. Mommsen 1892: 669–835; ed. Krusch 1938: 16–52.

Vitruvius. *De architectura libri decem*, ed. F. Krohn (Leipzig: Teubner, 1912).

Zonaras. *Ioannis Zonarae epitome historiarum*, ed. L. Dindorf, 3 vols. (Leipzig: Teubner, 1868–75).

2. MODERN AUTHORS

Adler, William (1989). *Time Immemorial: Archaic History and its Sources in Christian Chronography from Julius Africanus to George Syncellus* (Washington, DC: Dumbarton Oaks).

—— (2004). 'Sextus Julius Africanus and the Roman Near East in the Third Century', *JThS* 55: 520–50.

—— and Tuffin, Paul (2002). *The Chronography of George Synkellos: A Byzantine Chronicle of Universal History from the Creation*, translated with introduction and notes by William Adler and Paul Tuffin (Oxford: Oxford University Press).

Aggoula, B. (1992). 'Studia Aramaica III', *Syria*, 69: 391–422.

Albright, William F. (1943) 'The Gezer Calendar', *Bulletin of the American Schools of Oriental Research*, 82: 18–24.

Andrei, Osvald (2006). 'Dalle Chronographiai di Giulio Africano alla Synagoge di "Ippolito". Un dibattito sulla scrittura cristiana del tempo', in Wallraff 2006: 113–45.

Anscombe, A. (1895). 'The Paschal Canon Attributed to Anatolius of Laodicea', *English Historical Review*, 19: 515–35.

Auxentios, Bishop of Photiki (1995). *The Paschal Fire in Jerusalem: A Study of the Rite of the Holy Fire in the Church of the Holy Sepulchre* (Berkeley, CA: Saint John Chrysostom Press).

Aveni, Anthony (1998). 'The Star of Bethlehem', *Archaeology*, 51: 34–8.

Bagnall, Roger and Worp, Klaas A. (2004). *The chronological systems of Byzantine Egypt* (Zutphen: Terra Publishing, 1978; 2nd edn. Leiden: E. J. Brill, 2004).

Bainton, Roland (1923). 'Basilidian Chronology and New Testament Interpretation', *JBL* 42: 81–134.

Baldovin, John (2003). 'Hippolytus and the Apostolic Tradition: Recent Research and Commentary', *Theological Studies*, 64: 520–42.

Baluze, Étienne (1678). *Miscellaneorum liber primus* [*–septimus*], *hoc est collectio veterum monumentorum quæ hactenus latuerant in variis codicibus ac bibliothecis* (Paris: F. Muguet, 1678–1715; new edition in 4 vols., ed. Giovan Domenico Mansi, Lucca: apud V. Junctinium, 1761–4).

Bar-Ilan, Meir (2004). 'Astrology and Astronomy in Ancient Judaism', *The Encyclopaedia of Judaism*, ed. J. Neusner, A. Avery-Peck, and W. S. Green, v, supp. 2 (Leiden: E. J. Brill), 2031–44.

Barnes, Timothy D. (1968). 'Pre-Decian Acta Martyrum', *JThS* 19: 509–31.

—— (1970). 'The Chronology of Montanism', *JThS* 21: 403–8.

—— (1973). 'Lactantius and Constantine', *JRS* 63: 29–46.

—— (1974). 'The Victories of Augustus', *JRS* 64: 21–6.

—— (1978). 'Emperors and Bishops, AD 324–344: Some Problems', *American Journal of Ancient History*, 3: 53–75.

—— (1980). 'The Editions of Eusebius's Ecclesiastical History', *Greek, Roman and Byzantine Studies*, 21: 191–201.

—— (1993). *Athanasius and Constantius* (Cambridge, MA: Harvard University Press).

—— (1997). 'The Collapse of the Homoeans in the East', *Studia Patristica*, 29: 1–16.

Bauer, Adolf, and Strzygowski, Josef (1905). *Eine alexandrinische Weltchronik* (Vienna: A. Hölder).

Bautz, Friedrich Wilhelm (1990). 'Dionysius Exiguus', *Biographisch-bibliographisches Kirchenlexikon*, i: 1322–3 (Hamm: Bautz; published electronically at http://www.bautz.de/bbkl/d/dionysius_exiguus.shtml, accessed 2 March 2007).

Beaucamp, Joëlle, Bondoux, R., Lefort, J., Rouan, Marie-France, and Sorlin, Irène (1979). 'Temps et histoire. I: Le prologue de la Chronique pascale', *Travaux et mémoires,* 7: 223–301.

Beckwith, Roger (1996). *Calendar and Chronology, Jewish and Christian: Biblical, Intertestamental and Patristic Studies* (Leiden: E. J. Brill).

Belenkiy, Ari (2002). 'The Jewish Calendar in the Roman period: in search of a viable calendar system', published electronically, http://www.cs.biu.ac.il/~belenka/roman.pdf, accessed 2 March 2007.

—— and McKay, Brendan (2003). 'A Talmudic Puzzle and the Jewish Calendar in the Late Third Century', Published electronically, www.cs.biu.ac.il/~belenka/Beller-HUCA.pdf, accessed 2 March 2007.

Bennett, Chris (2003). 'The Early Augustan Calendars in Rome and Egypt', *Zeitschrift für Papyrologie und Epigraphik*, 142: 221–40.

Berezhkov, N. G. (1963). *Khronologiya russkogo letopisaniya* (Moscow: Izdatel'stvo Akademii nauk SSSR).

Bickerman, E. J. (1943). 'Notes on Seleucid and Parthian Chronology', *Berytus*, 8: 73–84.

—— (1968). *Chronology of the Ancient World* (London: Thames & Hudson).
Bond, John James (1872). 'The Christian Era', *Transactions of the Royal Historical Society.* 1: 72–81.
—— (1875). *Handy-Book of Rules and Tables for Verifying Dates with the Christian Era*, 2nd edn. (London: G. Bell).
Borkowski, K. M. (1991). 'The Tropical Year and Solar Calendar', *JRASC* 85: 121–30.
Bowersock, G. W. (1995). *Martyrdom and Rome* (Cambridge, MA: Harvard University Press).
Bradshaw, Paul F., (1992). *The Search for the Origins of Christian Worship: Sources and Methods for the Study of Early Liturgy* (Oxford: Oxford University Press).
—— Johnson, Maxwell E., and Phillips, L. Edward (2002). *The Apostolic Tradition: A Commentary* (Minneapolis, MN: Fortress Press).
Brakke, David (1995). *Athanasius and the Politics of Asceticism* (Oxford: Oxford University Press).
Brent, Allen (1995). *Hippolytus and the Roman Church in the Third Century: Communities in Tension before the Emergence of a Monarch-Bishop* (Leiden: E. J. Brill).
Brind'Amour, P. (1980). 'La date du martyre de saint Polycarpe (23 fév. 167)', *Analecta Bollandiana*, 98: 456–62.
Brock, Sebastian (1995). *Catalogue of Syriac Fragments (New Finds) in the Library of the Monastery of Saint Catherine, Mount Sinai* (Athens: Mount Sinai Foundation).
Brosset, Marie-Félicité (1830). *Chronique géorgienne* (Paris: De l'Imprimerie royale).
—— (1849). *Histoire de la Géorgie depuis l'antiquité jusqu'au XIX^e siècle* (St Petersburg: Académie impériale des sciences, 1849–57).
—— (1851). *Rapports sur un voyage archéologique dans la Géorgie et dans l'Arménie, exécuté en 1847–1848* (St Petersburg: Académie Impériale des Sciences).
—— (1868). *Études de chronologie technique, Première partie* (St Petersburg: Académie Impériale des Sciences).
—— (1874). *Collection d'historiens arméniens,* 2 vols. (St Petersburg: Académie imperiale des sciences, 1874–6; reprint in one volume, Amsterdam: APA-Philo Press, 1979).
Broutian (Brutean), Grigor (1997). *Oratsouyts Hayots (Armenian Calendar)* (Etchsmiadzin: Mayr At'or Surb).
Bucher, Aegidius (Gilles Bouchier) (1634). *De doctrina temporum: commentarius in Victorium Aquitanum nunc primum post MCLXXVII annos in lucem editum, aliosque antiquos canonum paschalium scriptores, chronologiae ecclesiasticae illustrandae ac stabiliendae utilissimos* (Antwerp: Ex officina Plantiniana Balthasaris Moreti).
Burgess, Richard W. (1997). 'The Dates and Editions of Eusebius' Chronici Canones and Historia Ecclesiastica', *JThS* 48: 471–504.
—— (1998). *Studies in Eusebian and Post-Eusebian Chronography* (Stuttgart: F. Steiner).
—— (2002). 'Jerome Explained: An Introduction to his Chronicle and a Guide to its Use', *Ancient History Bulletin*, 16: 1–32.
—— (2006). 'Africanus' Chronology for Christ and the Date of the Chronographiae', in Wallraff 2006: 39–42.

Burmester, Oswald H. E. (1938). 'On the Date and Authorship of the Arabic Synaxarium of the Coptic Church', *JThS* 39: 249–53.

Bury, J. B. (1923). 'The Provincial List of Verona', *JRS* 13: 127–51.

Cadoux, T. J. (1948). 'The Athenian Archonship from Kreon to Hypsichides', *JHS* 68: 70–123.

Cameron, Averil (1969). 'Agathias on the Sassanians: Text, Translation, and Commentary', *DOP* 23: 67–183.

—— and Hall, Stuart G. (1999). *Eusebius: Life of Constantine. Introduction, Translation and Commentary* (Oxford: Clarendon Press).

Camplani, Alberto (1989). *Le lettere festali di Atanasio di Alessandria : studio storico-critico* (Rome: C.I.M.).

—— (1993). 'Sull'origine della Quaresima in Egitto', *Acts of the Fifth International Congress of Coptic Studies* (Rome, C.I.M.) ii: 107–21.

—— (2003). *Atanasio di Alessandria, Lettere festali; Anonimo, Indice delle lettere festali; Introduzione, traduzione, e note* (Milan: Paoline).

Catholic Encyclopedia: An International Work of Reference on the Constitution, Doctrine, Discipline, and History of the Catholic Church, ed. Charles G. Herbermann, Edward A. Pace, Condé B. Pallen, Thomas J. Shahan, John J. Wynne, 15 vols. (New York: Robert Appleton, 1907–12).

Cerrato, J. A. (2002). *Hippolytus between East and West: The Commentaries and the Provenance of the Corpus* (Oxford: Oxford University Press).

Chaîne, Marius (1925). *La Chronologie des temps chrétiens de l'Égypte et de l'Éthiopie* (Paris: P. Geuthner).

Chamchian, Michael (Chamchiantsi, Mikayel) 1784. *History of Armenia from the Beginning of the World to AD 1784*, 3 vols. (Venice: Mechitarist Press, 1784–6).

Chapront-Touze, M., and Chapront, J. (1988). 'ELP 2000–85: A Semi-Analytical Lunar Ephemeris Adequate for Historical Times', *A&A* 190: 342–52.

Chekin, Leonid (1999). 'Easter Tables and the Pseudo-Isidorean Vatican Map', *Imago Mundi*, 51: 13–23.

Cichorius, Conrad (1923). 'Chronologische zur Leben Jesus', *Zeitschrift für die neutestamentliche Wissenschaft und die Kunde der älteren Kirche*, 22: 16–20.

Clarke, Adam (1810–25). *The Holy Bible: Containing the Old and New Testaments*, 8 vols. (London: J. Butterworth and Son; new edn. in 6 vols., London: Thomas Tegg and Son, 1836, most recently repr. Nashville, TN: Abingdon Press, 1977).

Clinton, Henry (1834, 1841, 1851). *Fasti Hellenici*, vol. i 1834, vol. ii (3rd edn.) 1841, vol. iii (2nd edn.) 1851 (Oxford: Clarendon Press).

Conley, Thomas (2004). 'Vituperation in Early Seventeenth Century Historical Studies', *Rhetorica*, 22: 169–82.

Conybeare, Frederick C. (1897). 'Ananias of Shirak', *BZ* 6: 574–84.

—— (1906). 'The Codex of the Paschal Chronicle Used by Holstein', *JThS* 7: 392–7.

—— (1907). *The Armenian Version of Revelation and Cyril of Alexandria's Scholia on the Incarnation and Epistle on Easter* (London: The Text and Translation Society).

Coquin, R. G. (1967). 'Les origines de l'Épiphanie en Égypte', in B. Botte et al. (eds.), *Noël, Épiphanie, retour du Christ* (Lex Orandi, 40; Paris: Éditions du Cerf).

Cramer, Andreas Wilhelm (1826). *De fragmentis nonnullis vetustarum membranarum* (Kiel: E Regio Typographeo Scholarum).

Cureton, William (1848). *See* Athanasius.

Daunoy, F. (1925). 'La question pascale au concile de Nicée', *Échos d'Orient*, 24: 424–44.

Declercq, Georges (2000). *Anno Domini: The Origins of the Christian Era* (Turnhout: Brepols).

—— (2002). 'Dionysius Exiguus and the Introduction of the Christian Era', *Sacris Erudiri*, 41: 165–246.

Degrassi, Attilio (1954). *Fasti Capitolini* (Turin: G. B. Paravia).

—— (1963). *Fasti consulares et triumphales*, *Inscriptiones Italiae*, xiii/1 (Rome: La Libreria dello Stato).

Depuydt, Leo (1997). 'The Time of Death of Alexander the Great: 11 June 323 BC, ca. 4:00–5:00 PM', *Welt des Orients* 28: 117–35.

—— 2002. 'The Date of Death of Jesus of Nazareth', *JAOS* 122: 466–80.

Develin, Robert (1989). *Athenian Officials, 684–321 B.C.* (Cambridge: Cambridge University Press).

Devos, P. (1990). 'Mega Sabbaton chez saint Épiphane', *Analecta Bollandiana*, 108: 293–306.

Di Segni, Leah (1992). 'The Date of the Church of the Virgin in Madaba', *Liber Annuus*, 42: 251–7.

—— (1993). 'The Beth Safafa Inscription Reconsidered and the Question of a Local Era in Jerusalem', *Israel Exploration Journal*, 43: 157–68.

Diekamp, Franz (1900). 'Der Monch und Presbyter Georgios', *BZ* 9: 14–51.

Dietze, Joachim (1971). *Die erste Novgoroder Chronik nach ihrer ältesten Redaktion*, with introduction translated into English by Leonard Jones (Munich: O. Sagner).

Dimnik, Martin (1981). *Mikhail, Prince of Chernigov and Grand Prince of Kiev, 1224–1246* (Toronto: Pontifical Institute of Mediaeval Studies).

Döllinger, Johann Joseph Ignaz von (1853). *Hippolytus und Callistus* (Regensburg: G. J. Manz); English tr. Alfred Plummer (Edinburgh: T. & T. Clark, 1876).

Duchesne, L. (1878). 'Inscription chrétienne de Bithynie', *Bulletin de correspondance hellénique*, 1878: 289–99.

—— 1880. 'La question de la Pâque au Concile de Nicée', *Revue des questions historiques*, 28 (1880) 5–42.

Dulaurier, Édouard (1859). *Recherches sur la chronologie arménienne, technique et historique* (Paris: Imprimerie Impériale).

—— (1883). *See* Stephanos of Taron.

Duta, Florian (1999). 'Des précisions sur la biographie de Denys le Petit', *Revue de droit canonique*, 49: 279–96.

Ebert, Joachim (1997). 'Zur neuen Bronzeplatte mit Siegerinschriften aus Olympia (Inv. 1148)', *Nikephoros*, 10: 217–33.

Encyclopaedia Britannica: A Dictionary of Arts, Sciences, Literature and General Information. 11th edn., 29 vols. (Cambridge: Cambridge University Press, 1910–11).

Espenak, Fred, and Meeus, Jan (2006). *Five Millennium Canon of Solar Eclipses: −1999 to +3000* (Washington, DC: National Aeronautics and Space Administration), also available electronically at http://sunearth.gsfc.nasa.gov/eclipse/SEcat5/catalog.html, accessed 1 November 2007.

Ferrar, W. J. (1981). *Eusebius: The Proof of the Gospel*, edited and translated by W. J. Ferrar, 2 vols. (London: Society for the Promotion of Christian Knowledge; repr. in 1 vol., Grand Rapids, MI: Baker Books, 1981).

Finegan, Jack (1964). *Handbook of Biblical Chronology: Principles of Time Reckoning in the Ancient World and Problems of Chronology in the Bible* (Princeton: Princeton University Press).

—— (1998). Rev. edn.; Peabody, Massachusetts: Hendrickson Publishers.

Fotheringham, J. K. (1919). 'Cleostratus', *JHS* 39: 164–184.

Frickel, Josef (1988). *Das Dunkel um Hippolyt von Rom. Ein Lösungsversuch: die Schriften Elenchos und Contra Noetum* (Graz: Institut für Ökumenische Theologie und Patrologie an der Universität Graz).

Gardner, Iain, and Lieu, Samuel (2004). *Manichaean Texts from the Roman Empire* (Cambridge: Cambridge University Press).

Garsoïan, Nina G. (1999). *L'Église arménienne et le grand schisme d'Orient* (Louvain: Peeters).

Gelzer, Heinrich (1898). *Sextus Julius Africanus und die byzantinische Chronographie*, 2 pts. (Leipzig: Teubner 1880, 1885); reissued in 1 vol. with supplementary 3rd part. (Leipzig: J. C. Hinrichs, 1898).

Gibbon, Edward (1788). *The History of the Decline and Fall of the Roman Empire*, 6 vols. (London: W. Strahan and T. Cadell, 1777–88).

Ginzel, F. K. (1906–14). *Handbuch der Mathematischen und Technischen Chronologie*, 3 vols. (Leipzig: J. C. Hinrichs).

Grafton, Anthony (1983). *Joseph Scaliger: A Study in the History of Classical Scholarship*, 2 vols. (Oxford: Oxford University Press, 1983–93).

Graindor, Paul (1934). *Athènes sous Hadrien* (Le Caire: Imprimerie nationale).

Granger, F. (1933). 'Julius Africanus and the Library of the Pantheon', *JThS* 34: 157–61.

Greenwood, Timothy W. (2003*a*). 'Armenian Colophons', unpublished translations of A. S. Matʻevosyan, *Hayerēn Jeṙagreri Hišatakarenner (Colophons of Armenian Manuscripts)* (Erevan, 1988), nos. 42–141. The translations can be downloaded at http://web.archive.org/web/*/http://users.ox.ac.uk/~orie0442/ArmColophons.doc, accessed 20 Feb 2008.

—— (2003*b*). 'Armenian Epigraphy', unpublished translations of a collection of Armenian inscriptions. The translations can be downloaded at http://web.archive.org/web/*/http://users.ox.ac.uk/~orie0442/ArmInscriptions.doc, accessed 20 Feb 2008.

—— (2004). 'A Corpus of Early Medieval Armenian Inscriptions', *DOP* 58: 27–91.

—— (2008). 'New Light from The East: Chronography and Ecclesiastical History through a Late Seventh-Century Armenian Source', *Journal of Early Christian Studies*, 16: 197–254.

Grenfell, B. P. (1894). 'A Horoscope of the Year 316 A.D.', *Classical Review*, 8: 70–1.
Grenier, Jean-Claude (1983). 'Le stèle funéraire du dernier taureau Bouchis', *Bulletin de l'Institut Français d'Archéologie orientale* 83: 197–209.
Grumel, Venance (1958). *La Chronologie* (Paris: Presses Universitaires de France).
—— (1964). 'La date de l'équinoxe vernal dans le canon pascal d'Anatole de Laodicée', *Mélanges Eugène Tissérant*, ii: 217–40 (Vatican City: Biblioteca Apostolica Vaticana).
Guarducci, Margherita (1977). 'La statua di "sant'Ippolito"', *Ricerche su Ippolito* (Studia Ephemeridis 'Augustinianum', 13; Rome: Institutum patristicum Augustinianum), 17–30.
Hacikyan, Agop J. (2005). *The Heritage of Armenian Literature*, 3 vols. (Detroit: Wayne State University Press, 2000–5).
Hagen, Joannes van der (1733). *Observationes in Prosperi Aquitani chronicon* (Amsterdam: J. Boom).
—— (1735). *Observationes in Theonis fastos graecos priores* (Amsterdam: J. Boom).
—— (1736*a*). *Dissertationes de cyclis Paschalibus* (Amsterdam: J. Boom).
—— (1736*b*). *Observationes in Heraclii imperatoris methodum Paschalem; ut et in Maximi monachi computum Paschalem; nec non in anonymi chronicon Paschale, ejusque chronotaxin & methodum Paschalem* (Amsterdam: J. Boom).
Hannah, Robert (2005). *Greek and Roman Calendars: Constructions of Time in the Classical World* (London: Duckworth).
Hanssens, Jean Michel (1959). *La Liturgie d'Hippolyte: ses documents, son titulaire, ses origines et son caractère* (Rome: Pontificum Institutum Orientalium Studiorum).
Harris, J. Rendel, and Robinson, J. Armitage (1891). *The Apology of Aristides on Behalf of the Christians: From a Syriac Ms. Preserved on Mount Sinai* (Cambridge: Cambridge University Press).
Hartke, Wilhelm (1956). *Über Jahrespunkte und Feste, insbesondere das Weihnachtsfest* (Berlin: Akademie Verlag).
Heinimann, Felix (1945). *Nomos und Physis: Herkunft und Bedeutung einer Antithese im griechischen Denken des 5. Jahrhunderts* (Basel: F. Reinhardt 1945).
Helm, Rudolf (1923). *Eusebius' Chronik und ihre Tabellenform* (Berlin: Walter de Gruyter).
Hendy, Michael (1972). 'Mint and Fiscal Administration under Diocletian, His Colleagues, and His Successors A.D. 305–24', *JRS* 62: 75–82.
Herschel, Sir John F. W. (1849). *Outlines of Astronomy* (London: Longman, Brown, Green, and Longmans).
Hess, Hamilton (1958). *The Canons of the Council of Sardica, A.D. 343; A Landmark in the Early Development of Canon Law* (Oxford: Clarendon Press).
—— (2002). *The Early Development of Canon Law and the Council of Serdica* (Oxford: Oxford University Press).
Hewsen, Robert H. (1968) 'Science in Seventh-Century Armenia: Ananias of Sirak', *Isis*, 59: 32–45.
Hirschfeld, Gustav (1873). 'Die Familie des Titus Flavius Alkibiades', *Hermes*, 7: 52–61.

Hohl, E. (1933). 'Wann hat Tiberius das Prinzipat übernommen?', *Hermes*, 68: 106–15.

Holford-Strevens, Leofranc (1999). *The Oxford Companion to the Year*, co-authored with Bonnie J. Blackburn (Oxford: Oxford University Press); all citations are from Part 2, written entirely by Holford-Strevens.

—— (2001). Review of Declercq 2000, *Peritia*, 15: 401–10.

—— (2005). *The History of Time: A Very Short Introduction* (Oxford: Oxford University Press).

Ideler, Ludwig (1825–6). *Handbuch der mathematischen und technischen Chronologie*, 2 vols. (Berlin: A. Rücker).

—— (1831). *Lehrbuch der Chronologie* (Berlin: A. Rücker).

Jacoby, Felix (1904). *Das Marmor Parium* (Berlin: Weidmann).

Jan, Johann Wilhelm (1718). 'Historia Cycli Dionysii', published with his edition of Dionysius Exiguus, repr. *PL* 67. 453–83.

Jaubert, Annie (1965). *The Date of the Last Supper* (Staten Island, NewYork: Alba House, 1965); original title, *La Date de la Cène; calendrier biblique et liturgie chrétienne* (Paris: J. Gabalda, 1957).

Jones, Charles W. (1935). 'The Victorian and Dionysiac Paschal Tables in the West', *Speculum*, 9 (1935), 408–21.

—— (1943) *Bedae Opera de Temporibus* (Cambridge, MA: The Mediaeval Academy of America).

—— (1977). Revised edition of Bede's *de temporum ratione* (Corpus Christianorum, series Latina, 123B; Turnhout: Brepols).

Kapetanopoulos, Elias (1990). 'The Archon Phileinos', *Epigraphica*, 52: 21–32.

Karst, Josef (1911). *See* Eusebius.

Keller, Werner (1955). *Und die Bibel hat doch recht* (Düsseldorf: Econ-Verlag; English tr. William Neil, *The Bible as History* New York: W. Morrow, 1956).

Kepler, Johannes (1606). *De stella nova in pede Serpentarii et qui sub ejus exortum de novo iniit, trigono igneo* (Prague: Ex Officina calcographica Pauli Sessii).

—— (1614). *De vero anno quo aeternus Dei filius humanam naturam in utero benedictae virginis Mariae assumpsit* (Frankfurt: Typis ac sumptibus Ioannis Bringeri).

Klein, Ralph W. (1974). 'Archaic Chronologies and the Textual History of the Old Testament', *Harvard Theological Review*, 67: 255–63.

Kokkinos, Nikos (1989). 'Crucifixion in AD 36: The Keystone for Dating the Birth of Jesus', in Vardaman and Yamouchi 1989: 133–63.

Kroll, W. (1917). 'Julius Africanus', *RE* 10: 116–25.

Krusch, Bruno (1880). *Studien zur christlich-mittelalterlichen Chronologie. Der 84jährige Ostercyclus und seine Quellen* (Leipzig: Veit).

—— (1884). 'Die Einführung des griechischen Paschalritus im Abendlande', *Neues Archiv*, 9: 99–169.

—— (1926). 'Ein Bericht der päpstlichen Kanzlei', in Albert Brackmann ed., *Papsttum und Kaisertum* (Munich: Verlag der Münchner Drucke), 47–58.

—— (1938). *Studien zur christlich-mittelalterlichen Chronologie: Die Entstehung unserer heutigen Zeitrechnung* (Abhandlungen der Preußischen Akademie der

Wissenschaften. Jahrgang 1937. Phil.-hist. klasse. Nr. 8; Berlin: Akademie der Wissenschaften, 1938).

Kubitschek, Wilhelm (1915). *Die Kalenderbücher von Florenz, Rom und Leyden* (Vienna: A. Hölder).

—— (1928). *Grundriß der antiken Zeitrechnung* (Munich: Beck).

Lang, David Marshall (1957). *The Wisdom of Balahvar: A Christian Legend of the Buddha* (London: Allen and Unwin).

Lazzarato, Damiano (1952). *Chronologia Christi* (Naples: M. d'Auria).

Lefort, Louis-Theophile (1955). *Lettres festales et pastorales en copte* (Louvain: L. Durbecq).

Lejbowicz, Max (2006). 'Des tables pascales aux tables astronomiques et retour', *Methodos: Savoirs et textes* 6. Published only electronically, http://methodos.revues.org/document538.html, accessed 16 August 2006.

Lieske, J. H., Lederle, T., Fricke, W., and Morando, B. (1977) 'Expressions for the Precession Quantities Based Upon the IAU(1976) system of astronomical constants', *A&A* 58: 1–16.

Lo Cascio, Elio (2005). 'The New State of Diocletian and Constantine: From the Tetrarchy to The Reunification of the Empire', *Cambridge Ancient History*, xii. 170–83 (2nd edn., Cambridge: Cambridge University Press).

Loi, Vincenzo (1977). 'L'identità letteraria di Ippolito di Roma', *Ricerche su Ippolito* (Studia Ephemeridis 'Augustinianum', 13; Rome: Institutum patristicum Augustinianum), 9–16.

Ludolf, Hiob (1691). *Ad suam Historiam aethiopicam antehac editam Commentarius, in quo multa breviter dicta fusius narrantur* (Frankfurt am Main: Sumptibus Johannis David Zunneri, Typis Martini Jacqueti).

Mac Carthy, Bartholomew (1901). *Annals of Ulster*, iv: *Introduction and Index* (Dublin: Royal Irish Academy).

McCarthy, Daniel (1993). 'Easter Principles and a Lunar Cycle used by Fifth-Century Christian Communities in the British Isles', *JHA* 24: 204–24.

—— (1994). 'The Origin of the Latercus Paschal Cycle of the Insular Celtic Churches', *Cambrian Medieval Celtic Studies*, 28: 25–49.

—— (1996). 'The Lunar and Paschal Tables of *De ratione paschali* Attributed to Anatolius of Laodicea', *Archive for History of Exact Sciences*, 49: 285–320.

—— (1998). 'The Chronology of the Irish Annals', *PRIA* 98C: 203–55; revised version dated 21 March 2005 at https://www.cs.tcd.ie/Dan.McCarthy/chronology/synchronisms/annals-chron.htm, accessed 8 July 2006.

—— (2003). 'The Emergence of Anno Domini', in G. Jaritz and G. Moreno-Riaño (eds.), *Time and Eternity—The Medieval Discourse* (Turnhout: Brepols), 31–53.

—— (2008). 'Bede's Primary Source for the Vulgate Chronology in his Chronicles in *De temporibus* and *De temporum ratione*', in Dáibhí Ó Cróinín ed., *The Computus in Ireland and Europe* (Turnhout: Brepols), forthcoming.

—— and Breen, Aidan (2003). *The Ante-Nicene Christian Pasch: De ratione paschali, the Paschal Tract of Anatolius, bishop of Laodicea* (Dublin: Four Courts Press).

McCarthy, Daniel and Ó Cróinín, Dáibhí (1988). 'The Lost Irish 84-year Easter Table Recovered', *Peritia*, 6–7: 225–42.

McGiffert, Arthur Cushman (1890). Translation with notes of the *Historia Ecclesiastica* of Eusebius, *LNPNF*, Series Two, vol. 1.

Mähler, M. (1969). 'Denis le Petit, traducteur de la Vie de saint Pachôme', *La Vie latine de Saint Pachôme. Traduite du grec par Denys le Petit*, ed. H. Van Cranenburgh (Brussels: Société des Bollandistes), 28–48.

Maffei, Francesco Scipione (1740). *Osservazioni letterarie che possono servir di continuazione al Giornal de' letterati d'Italia*, 6 vols. (Verona: Dalla stamperia di Jacopo Vallarsi, 1737–40).

Mahé, J.-P. (2002). 'Les inscriptions de Hoṙomos', *Monuments Piot*, 81: 147–214.

Mann, Jacob (1922). *The Jews in Egypt and in Palestine under the Fatimid Caliphs: A Contribution to their Political and Communal History Based Chiefly on Genizah Material Hitherto Unpublished*, 2 vols. (London: Oxford University Press, 1920–2).

Mansi, Giovan Domenico (1740). 'Notae chronologicae, criticae, historicae', *Annales ecclesiastici, ab anno MCXCVIII, ubi desinit cardinalis Baronius* (Lucca: Typis Leonardi Venturini).

Mattingly, Harold (1930). 'Tribunicia Potestate', *JRS* 20: 78–91.

Mauro, Philip (1922). *The Chronology of the Bible* (New York: George H. Doran).

Meeus, Jean (1998). *Astronomical Algorithms*, 2nd edn. (Richmond, VA: Willmann-Bell).

—— and Savoie, Denis (1992). 'The History of the Tropical Year', *Journal of the British Astronomical Association*, 102: 40–2.

Meier, John P. (1991). *A Marginal Jew: Rethinking the Historical Jesus*, i (New York: Doubleday).

Mentz, Arthur (1908). 'Zur byzantinischen Chronologie: Eine Osterreform zur Zeit Justinians', *BZ* 17: 471–4.

Mercati, G. (1906). 'A Study of the Paschal Chronicle', *JThS* 7: 397–402.

Metzger, Bruce (1954). Review of Lazzarato 1952, *JBL* 73: 174–6.

Meyer, Eduard (1899). 'Principien der Rechnung nach Königsjahren', *Forschungen zur alten Geschichte*, ii (Halle: M. Niemeyer), 440–53.

Mijović, Pavle (1967). 'Il calendario pasquale di Ravenna per gli anni 532–626', *Felix Ravenna*, 96: 5–31.

Milanković, Mulutin (1924). 'Das Ende des julianischen Kalenders und der neue Kalender der orientalischen Kirchen', *Astronomische Nachrichten*, Bd. 220, Nr. 5279: 379–84.

Millar, Fergus (1971). 'Paul of Samosata, Zenobia and Aurelian: The Church, Local Culture and Political Allegiance in Third-Century Syria', *JRS* 61: 1–17.

Miller, Emmanuel (1851). *Origenis Philosophoumena sive Omnium Haeresium Refutatio* (Oxford: E Typographeo Academico).

Miller, Stephen G. (1975). 'The Date of Olympic Festivals', *Mitteilungen des Deutschen Archäologischen Instituts, Athenische Abteilung*, 90: 215–237.

Miller, S. N. (1927). 'The British Bishops at the Council of Arles (314)', *The English Historical Review*, 42: 79–80.

Molnar, Michael (1999). *The Star of Bethlehem: The Legacy of the Magi* (New Brunswick, NJ: Rutgers University Press).
Mommsen, Theodor (1854–6). *Römische Geschichte*, 3 vols. (Berlin: Weidmann).
—— (1862). 'Verzeichnis der römischen Provinzen, aufgesetzt um 297', *Abhandlungen der Königlich Preußischen Akademie in Berlin, Historisch-philologische Klasse*, 489–538.
—— (1877). *Römisches Staatsrecht*, 3 vols. in 4 (Leipzig: S. Hirzel, 1876–88).
—— (1883). *Res gestae divi Augusti. Ex monumentis Ancyrano et Apolloniensi* (Berlin: Weidmann).
—— (1892, 1894, 1898). *Chronica Minora*, 3 vols. (*MGH*, Auctores Antiquissimi, 9, 11, 13; Berlin: Weidmann).
Mosley, John (1981). 'Common Errors in "Star of Bethlehem" Planetarium Shows', reprinted from *The Planetarian*, 10/3, at http://www.ips-planetarium.org/planetarian/articles/common_errors_xmas.html, accessed 24 March 2008.
Mosshammer, Alden A. (1979). *The Chronicle of Eusebius and Greek Chronographic Tradition* (Lewisburg, Pennsylvania: Bucknell University Press).
—— (1998). 'Christliche Zeitrechnung', *Religion in Geschichte und Gegenwart: Handwörterbuch für Theologie und Religionswissenschaft*, ii. 356–60 (Tübingen: Mohr Siebeck).
—— (2006). 'The Christian Era of Julius Africanus: With an Excursus on Olympiad Chronology', in Wallraff 2006: 83–112.
—— (2009). 'The Computus of 455 and the Laterculus of Augustalis, with an Appendix on the Fractional Method of Agriustia', 2nd International Conference on the Science of Computus, Galway, 18–20 July 2008, publication pending.
Münter, D. Friedrich (1827). *Der Stern der Weisen: Untersuchungen über das Geburtsjahr Christi* (Copenhagen: J. H. Schubothe).
Muratori, Ludovico Antonio (1713). *Anecdota, quae ex Ambrosianae bibliothecae codicibus nunc primum eruit, notis, ac disquisitionibus auget Ludovicus Antonius Muratorius* (Milan: Typis Iosephi Pandulfi Malatestae).
Musurillo, Herbert (1972). *Acts of the Christian Martyrs: Introduction, Texts and Translations* (Oxford: Oxford University Press).
Nautin, Pierre (1947). *Hippolyte et Josipe* (Paris: Éditions du Cerf).
Neugebauer, Otto (1950). 'The Alleged Babylonian Discovery of the Precession of the Equinoxes', *JAOS* 70: 1–8.
—— (1958). 'Interpretationes astronomicae', in Paul of Alexandria, ed. de Boer: 135–46.
—— (1975). *A History of Ancient Mathematical Astronomy* (Berlin and New York: Springer-Verlag).
—— (1979*a*). *Ethiopic Astronomy and Computus* (Sitzungberichte der Österreichischen Akademie der Wissenschaften, 347: Vienna).
—— (1979*b*). 'Ethiopic Easter Computus', *Oriens Christianus*, 63: 87–102.
—— (1981). 'On the Computus Paschalis of "Cassiodorus" ', *Centaurus*, 25: 292–302.
—— (1988). *Abu Shaker's Chronography* (Sitzungsberichte der Österreichischen Akademie der Wissenschaften, 498: Vienna:).

Newcomb, Simon (1895). *The Elements of the Four Inner Planets and the Fundamental Constants of Astronomy; Supplement to the American Ephemeris and Nautical Almanac for 1897* (Washington, DC: Government Printing Office).

Newton, Isaac (1728). *The Chronology of Ancient Kingdoms Amended* (London: printed for J. Tonson and J. Osborn and T. Longman).

Niebuhr, Barthold Georg (1812). *Römische Geschichte*, 2 vols. (Berlin: Realschulbuchhandlung, 1811–12); English tr. Julius Charles Hare and Connop Thirlwall, *The History of Rome*, 3 vols. (Cambridge 1828–42).

Noris, Enrico (1696). *Annus et epochae Syromacedonum in vetustis urbium Syriae nummis praesertim Mediceis expositae. Additis Fastis consularibus anonymi omnium optimis. Accesserunt nuper Dissertationes de paschali Latinorum cyclo annorum LXXXIV, ac Ravennate annorum XCV* (Leipzig: Thomas Fritsch).

Notopoulos, James (1949). 'Studies in the Chronology of Athens under the Empire', *Hesperia*, 18: 1–57.

Noviomagus, Joannes (Johannes von Bronckhorst) (1537). *Bedae Presbyteri Anglosaxonis, monachi benedicti, viri literatissimi opuscula cumplura de temporum ratione diligenter castigata* (Cologne: Iohannes Prael).

Ó Cróinín, Dáibhí (1989). 'Is the Augsburg Gospel Codex a Northumbrian Manuscript?', in G. Bonner et al. (eds.), *Saint Cuthbert, His Cult and his Community to AD 1200*, 189–201 (Woodbridge: The Boydell Press).

O'Donnell, James J. (1982). 'The Aims of Jordanes', *Historia*, 31: 223–40.

Ogg, George (1947). 'The Computist of AD 243 and Hippolytus', *JThS* 48: 206–7.

—— (1954). 'The Tabella Appended to the Pseudo-Cyprianic De Pascha Computus in the Codex Remensis', *VC* 8: 134–44.

—— (1955). *The Pseudo-Cyprianic de Pascha Computus: Translated with Brief Annotations* (London: Society for the Promotion of Christian Knowledge).

—— (1962). 'Hippolytus and the Introduction of the Christian Era', *VC* 16: 2–18.

Omont, H. (1916). 'Minoïde Mynas et ses missions en Orient (1840–1855)', *Mémoires de l'Académie des Inscriptions et Belles-Lettres*, 40: 337–419.

Oost, Stewart Irvin (1961). 'The Alexandrian Seditions under Philip and Gallienus', *CP* 56: 1–20.

Oppert, Gustav Salomon (1900). 'Über die Entstehung der Ära Dionysiana und den Ursprung der Null', *Verhandlungen der Berliner Gesellschaft für Ethnologie und Urgeschichte*, 102–36.

Ormanian, Malachia (1910). *L'Église arménienne, son histoire, sa doctrine, son régime, sa discipline, sa liturgie, sa littérature, son présent* (Paris: Ernest Leroux).

Pagi, Antoine (1689). 'Dissertatio de periodo Graeco-Romana', *Critica historico-chronologica in Annales ecclesiasticos eminentmi. et reverendmi. Caesaris Cardinalis Baronii* (Paris: Edmund Martin, Joannes Boudot, & Stephanus Martin), pp. 1–xlix.

Pallarès, Joan Gómez (1994). 'Hacia una nueva edición de los *argumenta paschalia* de Dionisio el Exiguo', *Hispania Sacra*, 46 (1994) 13–31.

Palmer, William (1861). *Egyptian Chronicles*, 2 vols. (London: Longman, Green, Longman and Roberts).

Parker, Richard A., and Dubberstein, Waldo H. (1956). *Babylonian Chronology 626 B.C.–A.D. 75* (Providence, Rhode Island: Brown University Press).

Parvis, Sara (2006). *Marcellus of Ancyra and the Lost Years of the Arian Controversy, 325–345* (Oxford: Oxford University Press).

Petau, Denis (Dionysius Petavius) (1630). *Uranologion, sive Systema variorum authorum qui de sphaera ac sideribus eorumque motibus graece commentati sunt* (Paris: Sébastien Cramoisy); much of this material, including the 'Dissertatio de Graecorum aeris ac computis', repr. *PG* 19. 743–1460.

—— (1633). *Rationarium temporum in partes duas, libros tredecim* (Paris: Sébastien Cramoisy).

—— (1703). *Opus de Doctrina temporum: Auctius in hac nova editione notis & emendationibus quamplurimis, quas manu sua codici adscripserat Dionysius Petavius*, 2 vols., with supplementary 3rd vol. incorporating the *Uranologion* (Antwerp: G. Gallet); originally published as *Opus De doctrina temporum divisum in partes duas quarum prior τὰ τεχνικά temporum, posterior τὰ ἱστορούμενα complectitur*, 2 vols. (Paris: Sébastien Cramoisy, 1627).

Piccirillo, Michele (1994). 'Le due iscrizioni della cappella della Theotokos nel Wadi 'ayn Al-Kanisah sul monte Nebo', *Liber Annuus*, 44: 521–38.

Piper, Ferdinand (1858). *Karls des Großen Kalendarium und Ostertafel* (Berlin: Verlag der Königlichen Geheimen Ober-Hofbuchdruckerei).

Propp, William H. (1999). *Exodus 1–18: A New Translation with Introduction and Commentary* (New York: Doubleday).

Richard, Marcel (1950). 'Comput et chronographie chez saint Hippolyte', *Mélange de Science Religieuse*, 7: 237–68.

—— (1951). 'Comput et chronographie chez saint Hippolyte (II)', *Mélange de Science Religieuse*, 8: 19–50.

—— (1966). 'Notes sur le comput de cent-douze ans', *Mélanges Venance Grumel = Revue des études byzantines*, 24: 257–77 (Paris: Institut Français d'Études Byzantines).

—— (1973). 'Le florilège du cod. Vatopédi 236 sur le corruptible et l'incorruptible', *Le Muséon*, 86: 249–73.

—— (1974). 'Le comput pascal par octaétéris', *Le Muséon*, 87: 307–39.

Richards, E. G. (1998). *Mapping Time* (Oxford: Oxford University Press).

Robinson, J. Armitage (1895). *Euthaliana* (Cambridge: Cambridge University Press).

Rome, Adolphe (1931). *Commentaires de Pappus et de Théon d'Alexandrie sur l'Almageste* (Rome: Biblioteca Apostolica Vaticana).

Rothwangl, Sepp (2001). 'Consideration of the Origin of the Yearly Count in the Julian and Gregorian Calendars', in Sergio Colafrancesco and Giuliana Giobbi (eds.), *Cosmology through Time: Ancient and Modern Cosmologies in the Mediterranean Area* (Milan: Mimesis), 227–38.

Rühl, Franz (1897). *Chronologie des Mittelalters und der Neuzeit* (Berlin: Reuther & Reichard).

—— (1898) 'Der Ursprung des jüdischen Weltära', *Deutsche Zeitschrift für Geschichtswissenschaft*, 2: 185–6.

Rühl, Franz (1906). 'Die Rechnung nach Jahren vor Christus', *Rheinisches Museum*, n. F. 61: 628–9.

Russell, Norman (2000). *Cyril of Alexandria* (London: Routledge).

Salzman, Michele Renee (1990). *On Roman Time: The Codex-Calendar of 354 and the Rhythms of Urban Life in Late Antiquity* (Berkeley and Los Angeles: University of California Press).

Samuel, Alan E. (1972). *Greek and Roman Chronology: Calendars and Years in Classical Antiquity* (Munich: Beck).

Sanjian, Avedis K. (1966). 'Crazatik, Erroneous Easter–A Source of Greco-Armenian Religious Controversy', *Studia Caucasica*, 2: 26–47.

Scaliger, Joseph Justus (1629). *Opus de emendatione temporum: hac postrema editione, ex auctoris ipsius manuscripto, emendatius, magnaque accessione auctius* (Geneva); original edition, Paris: Apud Mamertum Patissonium typographum regium, 1583.

—— (1606*a*). *Animadversiones in chronologica Eusebi*, in *Thesaurus temporum, Eusebii Pamphili Caesareae Palaestinae episcopi, Chronicorum canonum omnimodae historiae libri duo,* ii, part 4 (5 parts in 2 vols., each part separately paginated, Leiden: Thomas Basson, 1606; 2nd edn, Amsterdam: Joannes Jansson, 1658).

—— (1606*b*). *Isagogicorum chronologiae canonum libri tres*, in *Thesaurus temporum*, ii, part 5.

Schmelzer, Menahem H. (1996). *Shalom Spiegel,The Fathers of the Piyyut: Texts and Studies* (New York: Bet ha-midrash le-rabanim ba-Amerikah).

Schoene, Alfred (1866–75). *See* Eusebius, *Chronicle.*

Schwartz, Eduard (1895). *Die Königslisten des Eratosthenes und Kastor, mit Excursen über die Interpolationen bei Africanus und Eusebius* (Abhandlungen der Königlichen Gesellschaft der Wissenschaften zu Göttingen, Philologisch-historische Klasse, 40/2; Göttingen: Dieterich).

—— (1899). 'Chronicon Paschale', *RE* iii/2: 2460–77; repr. *Griechische Geschichtsschreiber* (Leipzig: Koehler & Amelang, 1959), 291–316.

—— (1905). *Christliche und jüdische Ostertafeln.* Abhandlungen der Königlichen Gesellschaft der Wissenschaften zu Göttingen, Philologisch-historische klasse, n. F. 8/6 (Berlin: Weidmann).

—— (1907). 'Eusebius', *RE* vi/1: 1370–1439; repr. *Griechische Geschichtschreiber* (Leipzig: Koehler & Amelang, 1959), 495–598.

—— (1909). *Eusebius: Die Kirchengeschichte*, iii: Einleitung (Leipzig: Hinrichs).

—— (1910). *Über die pseudoapostolischen Kirchenordnungen*, Schriften der Wissenschaftlichen Gesellschaft in Straßburg 6 (Straßburg: K. J. Trübner); repr. *Gesammelte Schriften* 5 (Berlin: Walter de Gruyter 1963), 192–273).

Serruys, Daniel (1907*a*). 'De quelques ères usitées chez les chroniquers byzantins', *Revue de philologie*, 31: 151–89.

—— (1907*b*). 'Les transformations de l'aera alexandrina minor', *Revue de philologie*, 31: 251–64.

Serruys, Daniel (1913). 'Les Canons d'Eusèbe, d'Annianus et d'Andronicus d'après Élie de Nisibe', *BZ* 22: 1–36.

Shaw, Ian (2000). 'Introduction : chronologies and cultural change in Egypt', *The Oxford History of Ancient Egypt*, ed. Ian Shaw (Oxford: Oxford University Press), 1–16.

Sickinger, James (1999). *Public Records and Archives in Classical Athens* (Chapel Hill: University of North Carolina Press).

Silogava, V., and Schrade, B. (1996). 'Die Kathedrale Bagrati und ihre Inschriften', *Mitteilungsblatt der Berliner Georgischen Gesellschaft*, 50: 12–15.

Snyder, Walter F. (1943). 'When was the Alexandrian Calendar Established?', *AJP* 64: 385–98.

Stern, Sacha (1996). 'Fictitious Calendars: Early Rabbinic Notions of Time, Astronomy, and Reality', *The Jewish Quarterly Review*, 87: 103–29.

—— (2001). *Calendar and Community: A History of the Jewish Calendar, Second Century* BCE*–Tenth Century* CE (Oxford: Oxford University Press).

Strobel, August (1977). *Ursprung und Geschichte des frühchristlichen Osterkalenders* (Berlin: Akademie Verlag).

—— (1984). *Texte zur Geschichte des frühchristlichen Osterkalenders* (Münster: Aschendorff).

Strothmann, Werner (1977). *Codex Syriacus Secundus: Bibel-Palimpsest aus d. 6./7. Jh., Katalog Hiersemann 500/3* (Wiesbaden: Harrassowitz).

Talley, Thomas J. (2003). 'Further Light on the Quartodeciman Pascha and the Date of the Annunciation', *Studia Liturgica*, 33: 151–8.

Taylor, Lily Ross (1933). 'Quirinius and the Census of Judaea', *AJP* 54: 120–33.

—— (1946). 'The Date of the Capitoline Fasti', *CP* 41: 1–11.

—— (1950). 'Degrassi's Edition of the Consular and Triumphal Fasti', *CP* 45: 84–95.

Telfer, William (1943). 'The Codex Verona LX(58)', *Harvard Theological Review*, 36: 169–246.

Teres, Gustav (1984). 'Time Computations and Dionysius Exiguus', *JHA* 15: 177–88.

Tillemont, Louis-Sébastien Le Nain de (1690–1738). *Histoire des empereurs et des autres princes qui ont regné durant les six premiers siecles de l'Église*, 6 vols. (Paris: Charles Robustel).

Townsend, W. T. (1937). 'Councils Held under Pope Symmachus', *Church History*, 6: 233–259.

Treadgold, Warren (2007). *The Early Byzantine Historians* (New York: Palgrave Macmillan).

Trieber, Conrad (1880). 'Die Chronologie des Julius Africanus', *Nachrichten der königlichen Gesellschaft der Wissenschaft zu Göttingen*, 1880: 49–76.

Turkia, Severian, and Paghava, Irakli (2005). 'The Date on the 8-Rosette and 4-Line Irregular-Shaped Copper Coins of Queen Tamar', *Oriental Numismatic Society Newsletter*, 183.

Turner, C. H. (1895). 'The Paschal Canon of Anatolius of Laodicea', *English Historical Review*, 19: 699–710.

Unger, Georg Friedrich (1867). *Chronologie des Manetho* (Berlin: Weidmann).

Unger, Georg Friedrich (1881). 'Diodors Quellen im XI. Buch', *Philologus*, 40: 48–106.

—— (1886). 'Zeitrechnung der Griecher und Römer', *Handbuch der klassischen Altertumswissenschaft*, i: *Einleitende und Hilfsdisziplinen* (Nördlingen: C. H. Beck).

—— (1895). 'Die Seleukidenära der Makkabäerbücher', *Sitzungsberichte der philosophisch-philologisch-historischen Klasse der königlich bayerischen Akademie der Wissenschaften zu München*, 25: 236–316.

Ussher, James (1658). *The Annals of the World Deduced from the Origin of Time, and Continued to the Beginning of the Emperour Vespasian's Reign* (London: Printed by E. Tyler, for J. Crook and G. Bedell).

Van de Vyver, André (1957). 'L'évolution du comput alexandrin et romain du III^e^ au V^e^ siècle', *Revue d'histoire ecclésiastique*, 52: 4–25.

Vanderkam, James (1998). *Calendars in the Dead Sea Scrolls* (London and New York: Routledge).

Vardaman, Jerry (1989). 'Jesus' Life: A New Chronology', in Vardaman and Yamauchi 1989: 55–82.

—— and Yamauchi, Edwin (1989). *Chronos, Kairos, Christos: Nativity and Chronological Studies Presented to Jack Finegan* (Winona Lake, IN: Eisenbrauns).

Vieillefond, Jean-René (1970). *Les Cestes de Julius Africanus* (Paris: Librairie M. Didier).

Walch, Christian Wilhelm Franz (1770). 'Decreti Nicaeni de Paschate Explicatio', *Novum Commentarium Societatis Regiae Scientiarum Goettingensis, commentationes historicae et philologicae* 1: 10–65 (Göttingen, 1770).

Wallis, Faith (1999). *Bede: The Reckoning of Time*, translation and commentary (Liverpool: Liverpool University Press).

Wallraff, Martin (2006). *Julius Africanus und die christliche Weltchronistik* (Berlin: Walter de Gruyter).

—— (2007). *Iulius Africanus: Chronographiae. The Extant Fragments* (Berlin: Walter de Gruyter).

Warntjes, Immo (2007). 'The Munich Computus and the 84 (14)-year Easter reckoning', *PRIA* 107: 31–85.

Wellesley, K. (1967). 'The Dies Imperii of Tiberius', *JRS* 57: 23–30.

Wheatley, Patrick (1988). 'The Chronology of the Third Diadoch War, 315–311 BC', *Phoenix*, 52: 257–81.

Whitby, Michael and Mary (1989). *Chronicon Paschale, 284–628 AD*, translated with notes and introduction (Liverpool: Liverpool University Press, 1989).

Whitelock, Dorothy (1961). *The Anglo-Saxon Chronicle: A Revised Translation*, ed. Dorothy Whitelock, with David C. Douglas and Susie I. Tucker (London: Eyre and Spottiswoode, 1961).

Wijk, Walter Emile van (1936). *Le Nombre d'or; étude de chronologie technique, suivie du texte de la Massa compoti d'Alexandre de Villedieu* (The Hague: M. Nijhoff).

Willis, James A. (1972). 'The Multiples of the As', *Harvard Studies in Classical Philology*, 76: 233–44.

Wilson, Henry (1918). *The Calendar of St. Willibrord: From MS. Paris Lat. 10837: A Facsimile with Transcription, Introduction, and Notes* (London: Harrison and Sons).

Witakowski, Witold (1996). *The Chronicle of Pseudo-Dionysius of Tel-Mahre, Part III* (Liverpool: Liverpool University Press).

Zelzer, Michaela (1978). 'Zum Osterfestbrief des heiligen Ambrosius und zur römischen Osterfestberechnung des 4. Jahrhunderts', *Wiener Studien*, 91: 187–204.

This page intentionally left blank

Index