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COMPOTUS ECCLESIASTICUS

An Early Thirteenth Century Compotus
in its Context:

Edition and Commentary

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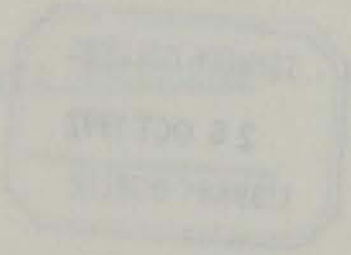
TABLE OF CONTENTS

Declarations	iii
Preface	iv
Acknowledgments	vi
Abbreviations	ix

COMPOTUS ECCLESIASTICUS

AN EARLY THIRTEENTH CENTURY COMPOTUS IN ITS CONTEXT:

I. Compotus: a Bibliographical Survey	1
Edition and commentary	
II. Compotus in the Schools	14
Appendix	59
III. COMPOTUS ECCLESIASTICUS: title, date, authorship, provenance	77
Appendix	120
IV. COMPOTUS ECCLESIASTICUS: content and sources	131
JENNIFER MORETON	
V. The Manuscripts	163
Appendix	188



SUMMARY	
I. The Solar Year	216
II. The Calculation of the Julian Year	217
Appendix	250
III. The Lunar Year	252
BIBLIOGRAPHY	307

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TABLE OF CONTENTS

Declarations	iii
Summary	iv
Acknowledgments	vi
Abbreviations	ix
 <u>Introduction</u>	
I. Compotus: a Bibliographical Survey.....	2
II. Compotus in the Monasteries and in the Schools..	18
Appendix.....	69
III. <u>Compotus ecclesiasticus</u> : title, date, authorship, provenance.....	72
Appendix.....	130
IV. <u>Compotus ecclesiasticus</u> : content and sources....	131
V. The Manuscripts.....	162
 <u>Compotus ecclesiasticus: Edition</u>	188
 <u>Commentary</u>	
I. The Solar Year.....	278
II. The Emendation of the Julian Year.....	313
Appendix.....	355
III. The Lunar Year.....	362
 <u>Bibliography</u>	399
 <u>Appendix</u>	
John of Sacrobosco, <u>De anni ratione</u>	428

DECLARATIONS.

I hereby declare that this thesis has not been submitted as an exercise for a degree at any other university.

Handwritten signature

I also declare that the work herein is entirely my own.

Handwritten signature

SUMMARY

This thesis presents an edition of an early thirteenth century Compotus, or treatise on time-reckoning, which has not previously to my knowledge been identified, although in the versions to be found in two MSS (Oxford, Bodl.679 and Dublin, Trin.441) it has been mistakenly attributed to Robert Grosseteste. It is my contention that the treatise, which I have called the Compotus ecclesiasticus, was, in fact, a standard elementary text for the quadrivium from the early thirteenth century onwards. The treatise exists in at least ten MSS, six of which have been used in the collation of this edition.

Compotus occupied a central position in medieval thought, but this fact is often underemphasised in secondary sources. The introduction accordingly surveys the work which has to be done before a worthwhile account of compotus can be written, and attempts to trace, with the aid of MSS material and primary printed sources, the history of compotus in the monasteries and, later, the schools. Material which has some bearing on the date, authorship and provenance of the Compotus ecclesiasticus is described, and the relationship of the treatise to the works of Robert Grosseteste and John of Sacrobosco is examined in some detail. The De anni ratione of the latter writer, of which there is no modern edition, is printed as an appendix from Philip Melanchthon's 1548 Wittenberg

version.

The content and sources of the Compotus ecclesiasticus are discussed in the introduction and, more exhaustively, in the commentary, where special attention is paid to a proposed emendation of the Julian year which prefigures the Gregorian Reform of 1582. The main purpose of the commentary is to bring together information on the sometimes recondite subject matter of compotus. It is thus in part a discussion of sources and parallels, in part an explanation of how compotus works.

ACKNOWLEDGEMENTS

First of all, my thanks are due to Professor I.S. Robinson for his tireless encouragement and support during the last eight years, particularly when my investigations led me in a very unexpected direction.

The observation of Professor James McEvoy that "Computus minor in Dublin, Trinity MS 441 has never seen the light of day",¹ set me off on an exciting voyage of discovery. My gratitude is due to him for this, and for his friendly support thereafter.

I was fortunate enough to be able to spend a year in Oxford during my research. My time there was made pleasant by the generous interest and advice of Sir Richard Southern, and the unfailing kindness of Lady Southern.

Professor Olaf Pedersen has described the students of Medieval astronomy as appearing like "a sect of wandering scholars".² I am grateful to him and to all the other scholars who have kindly made time in their travels to meet me, or who have so courteously answered my questions in

¹James McEvoy, "Questions of authenticity and chronology concerning works attributed to Robert Grosseteste and edited 1940-1980", Bulletin de Philosophie Médiévale 23 (1981), 89.

²Olaf Pedersen, "The Corpus astronomicum and the traditions of medieval Latin astronomy", Studia Copernicana 3 (1973), 58.

correspondence. Closer at hand, I have had friendly advice and encouragement from Dr Dan McCarthy of the Department of Computer Science, Trinity College.

My thanks are due to the Association of Senior Members of St Hilda's College, Oxford, for awarding me a research studentship in 1987-88. This, and a grant from the Neil Ker Foundation, enabled me to spend a constructive year building on foundations laid many years previously by Miss Anne Elliott and Miss Celia Sisam, Fellows Emeritae of St Hilda's College, Oxford.

I am grateful to Trinity College, Dublin for recommending me for the Luker-Cobbe Bursary, which enabled me to spend time in Cambridge in 1989, and to my own institution, the Dublin Institute of Technology, for allowing me study leave, and for helping me with one year's funding under the Zero Fees Scheme.

I extend grateful thanks to the staff of the many libraries in Ireland and abroad who have assisted me. In particular, my gratitude is due to the staff of the Manuscript Rooms of Trinity College, Dublin, the British Library and Cambridge University Library, and of Duke Humfrey's Library, all of whom have put their palaeographical expertise at my disposal. I thank also the Libraries in Bruges, Copenhagen and Vienna who have sent me reproductions of MSS.

Finally I should like to express my thanks to all my long-suffering friends for their support and interest, and to my sons for endlessly listening to me, and especially to Charles for his patience in locating information for me, and to Peter for his help with word-processing.

- CCRL = Corpus Carolinum, Series Latina, Turnhout.
- CCSL = Corpus Scriptorum Ecclesiasticorum Latinorum, Vienna.
- DE = Bede, De Temporum Libri, ed. C.W. Jones, *Bedae Opera De Temporibus* (Cambridge, Mass., 1943), pp. 293-303.
- DEI = Bede, De Tempore, ed. C.W. Jones, *Bedae Opera De Tempore*, pp. 171-181.
- ETS = Early English Text Society.
- Griffiths, *Index* = C.H. Griffiths, *Index to the History of Medieval Science* (New York 1934, repr. 1960).
- MGH = Monumenta Germaniae Historica.
- OHS = Oxford Historical Society.
- PL = Patrologia Latina, ed. J.P. Migne, 221 vols., Paris 1844-1865.
- PLM = Pontifical Institute of Medieval Studies, Toronto.
- Thorndike and Kibre = Lynn Thorndike and Paul Kibre, *A Catalogue of Incipits of Medieval Scientific Treatises in Latin* (revised ed., London 1963).

ABBREVIATIONS

- Arch.Franc.Hist. = Archivum Franciscanum Historicum.
- CC cont.med. = Corpus Christianorum, Series Latina, continuatio mediaevalis, Turnhout.
- CCSL = Corpus Christianorum, Series Latina, Turnhout.
- CSEL = Corpus Scriptorum Ecclesiasticorum Latinorum, Vienna.
- DT = Bede, De Temporibus liber, ed. C.W.Jones, Bedaes opera de temporibus (Cambridge, Mass., 1943), pp.295-303.
- DTR = Bede, De temporum ratione, ed. C.W.Jones, Bedaes opera de temporibus, pp.173-291.
- EETS = Early English Text Society.
- Haskins, Studies = C.H.Haskins, Studies in the history of Medieval Science (New York 1924, repr. 1960).
- MGH = Monumenta Germaniae Historica.
- OHS = Oxford Historical Society.
- PL = Patrologiae Series Latina, ed. J.P.Migne, 221 vols., Paris 1844-1865.
- Pont.Inst.Med.Stud. = Pontifical Institute of Mediaeval Studies, Toronto.
- Thorndike and Kibre = Lynn Thorndike and Pearl Kibre, A Catalogue of Incipits of Medieval Scientific Writings in Latin (revised ed., London 1963).

COMPUTUS ECCLESIASTICUS

Computus is the science of reckoning the divisions of time from the movement of sun and moon.

It is with this statement that the anonymous author of the Computus Ecclesiasticus Church Calendar begins his work. INTRODUCTION

The importance of this science throughout the Middle Ages can be deduced firstly from the outstanding writers, from Bede onwards, who concerned themselves with it, and secondly from the vast amount of anonymous computational material, much still unpublished, that survives in MS form. My attempt to understand the medieval mind must take account of computing. It was important theologically because it was concerned with time. The framework of the study is the account of Creation which is presented in the first chapter of Genesis. The biblical concept precedes, for example, the *Opus* of Bede and the *De Tempore* of Bede, one of the last great writers on the subject was Robert Grosseteste, who also produced a work on the *Computus*. His motivation in writing on the calendar was...

Computus ecclesiasticus p. 197: Computus est scientia constantis temporis aequalitatem secundum motum solis et lune.
Bede, *De Tempore*, ed. C. W. Jones, *Bedae Opera de Temporibus* (Cambridge Mass. 1937), pp. 173-191.

Chapter I.

Computus: a Bibliographical Survey.

Computus is the science of reckoning the divisions of time from the movement of sun and moon.¹

It is with this statement that the anonymous author of the Ecclesiastical Computus, or treatise on the Church Calendar, begins his work.

The importance of this science throughout the Middle Ages can be deduced firstly from the outstanding writers, from Bede onwards, who concerned themselves with it, and secondly from the vast amount of anonymous computistical material, much still unpublished, that survives in MS form. Any attempt to understand the medieval mind must take account of computus. It was important theologically because it was concerned with time. The framework of the study is the account of Creation which is presented in the first chapter of Genesis. The Biblical concept permeates, for example, the De temporum ratione of Bede.² One of the last great writers on the computus was Robert Grosseteste, who also produced a work on the Hexaemeron. His motivation in writing on the calendar was,

¹Computus ecclesiasticus p.197: Computus est scientia considerans tempora distincta secundum motum solis et lune.

²Bede, De temporum ratione, ed.C.W.Jones, Beda's opera de temporibus, (Cambridge Mass. 1943), pp. 173-391.

it has been suggested, theological.³

Given that so much of medieval science developed as a synthesis of Christian and ancient Graeco-Roman thought, it is important to notice at the outset that where the subject of time is concerned, such a synthesis was not possible. The Classical concept of time differed fundamentally from that of the Christian tradition. For the Classical world, time was impersonal, circular and infinite. The concept is given limpid expression by the fourth century writer Censorinus:

est enim immensem, sine origine, sine fine, quod eodem modo semper fuit et semper futurum est, neque ad quemquam hominum magis quam ad alterum pertinet. e quibus praeteritum initio caret, exitu finitum, praesens autem, quod medium est, adeo exiguum et incomprehensibile est.⁴

For the Christian, on the other hand, time is linear and finite, and controlled by God. St Augustine rejected the pagan concept of a cyclical universe. He expounded his ideas about time in Book XI of his Confessions: for him, time proceeds from a beginning (Creation) to an end (Judgement Day),

³James McEvoy, "Questions of authenticity and chronology concerning work attributed to Robert Grosseteste and edited 1940-1980" II, Bulletin de Philosophie Médiévale 24 (1982), 89. The Hexaemeron of Robert Grosseteste was edited by R.C.Dales and E.B.King, (Auctores Britannici Medii Aevi, London 1985). For Grosseteste and the computus, see later, pp.73ff.

⁴ Censorinus, De die natali, ed. F.Hultsche, (Leipzig, 1867), p.30.

punctuated by clearly marked historical events.⁵ Essential to the study of Computus is the concept of Creation as mathematical: omnia in mensura et pondere et numero disposuit (Sap.11,21).

Nature was created by God, when he ordered the stars he had set in the heavens to be for signs and for seasons and for days and for years.⁶ On time, therefore, He imposes His own order, and it is for this reason that, notwithstanding the concept of time just described, the Christian may for everyday purposes reckon it as circular. The Church Calendar is an annual repetition of Feast Days, Saints' Days and Year's Minds. And hence the practical importance of computus as a method of placing these dates so that they can be commemorated year by year.

It is of historical interest that computus, unlike astrology, is a genuine science. It has been suggested that scientific advances were made when scholars like Galileo began to turn their attention to definite limited problems, instead of speculating about the world as a whole.⁷ Computists have been

⁵S. Augustine, Confessions, (trans. R.S. Pine-Coffin, Penguin Classics 1961), pp.253-280.

⁶Bede, DTR p.182: ab uno vero Deo creata est, quando sideribus caelo inditis praecepit ut sint in signa et tempora et dies et annos.

⁷G.R. Whitrow, The Natural Philosophy of Time, (2nd ed., Oxford 1980), pp.19-20.

called "the first specialist scientists of the Middle Ages."⁸ Computus dealt with "definite limited problems", which were eventually to be solved in the context of the universities.⁹

Computus occupied a central position in medieval thought, but it has not generally been of much interest to historians. Alfred Cordoliani observed in 1960 that the history of the medieval ecclesiastical computus remained to be written.¹⁰ His observation is still true today. Indeed, I would suggest that there is much work to be done on MSS sources before such a history can be attempted. The latest, very accessible survey of the subject, based on printed sources, is by Arno Borst.¹¹ A collection of papers produced to commemorate the four hundredth anniversary of the Gregorian Reform of the Calendar contains much useful material.¹² Apart from these volumes, a good general survey of the subject remains that of R.R.Steele.¹³ The introduction to his edition of the Computus of Roger Bacon contains a brief explanation of the workings of

⁸Olaf Pedersen, "The Corpus astronomicum and the traditions of medieval Latin astronomy", Studia Copernicana 3 (1973), 64.

⁹See Chapter II.

¹⁰Alfred Cordoliani, "Contribution à la littérature du comput ecclésiastique au Moyen Age", Studi Medievali ser. 1,1 (1960), 107.

¹¹Arno Borst, Computus. Zeit und Zahl in der Geschichte Europas (Berlin 1990).

¹²ed. G.V.Coyne, M.A.Hoskin, Olaf Pedersen, Gregorian Reform of the Calendar (Pontificia Academia Scientiarum 1983).

¹³R.R.Steele, Opera hactenus inedita fratris Rogeri 6 (Oxford 1926), pp.vii-xxvii.

the Church Calendar and a chronological list of computistical treatises from the earliest beginnings to Campanus de Novara. Dealing with a more limited period, C.H.Haskins noted the part that compotus played in the intellectual revival that began in the early twelfth century.¹⁴ Both these writers had access to MS material. A nineteenth century study by Ferdinand Kaltenbrunner is still of value, despite his limited sources.¹⁵

Apart from these surveys, valuable secondary material is to be found in many different periodicals. Alfred Cordoliani pursued computistical material through the libraries of Europe, and wrote particularly on Gerland and his forerunners. C.W.Jones, apart from his magisterial editions of Bede, devoted many articles to the position of compotus in the Carolingian Schools. W.M.Stevens continues Jones's work in this area. A.van de Vijver wrote particularly on Abbo and his contemporaries. Reference is made to these and other writers in the Bibliography of this dissertation. The Isis Cumulative Bibliography is the most useful guide to current relevant material.

Reference has already been made to the mass of primary material which remains unprinted. MSS containing computistical

¹⁴C.H.Haskins, Studies in the History of Medieval Science (New York 1924, repr. 1960), pp.82-88.

¹⁵Ferdinand Kaltenbrunner, Vorgeschichte der Gregorianische Kalenderreform (Vienna 1876).

treatises or shorter items - notes on the calendar, mnemonic verses, tables and diagrams - are to be found in all the main collections in Europe, even in unexpected places, like the G.P.A. - Bolton Library in Cashel, Co. Tipperary.¹⁶ Olaf Pedersen has pointed out the difficulties of surveying astronomical material in general. When many of the existing catalogues were produced, identification of some treatises still presented a major problem. The result was that they were often wrongly attributed.¹⁷ Fortunately, many catalogues are undergoing revision,¹⁸ and some libraries allow access to less formally presented material.¹⁹ Thorndike and Kibre's great guide to medieval scientific Latin is indispensable.²⁰ So is Zinner, for the specific area he set out to cover.²¹

¹⁶Cashel MS 1 is described by its cataloguer as an "Encyclopedia of medieval knowledge". R. Wyse Jackson, "The oldest book in Cashel Library", North Munster Antiquarian Journal 6 (1951), 131, suggested that the codex could be dated to c.1170. It belonged at one point to Archbishop King. It is a collection of mainly calendar material, including extracts which appear to be from the Computus of Master William, with the addition of the Disciplina clericalis of Peter Alfonsi and other fables.

¹⁷Olaf Pedersen, "The Corpus astronomicum and the traditions of medieval Latin astronomy", 57.

¹⁸See, for instance, M.L. Colker, Trinity College Dublin: A descriptive Catalogue of the Medieval and Renaissance MSS (London 1991).

¹⁹See for instance the card-index compiled by B.F.C. Atkinson in Cambridge University Library. It lists the incipits of all works in pre-1500 MSS held by the Library.

²⁰Lynn Thorndike and Pearl Kibre, A Catalogue of Incipits of Medieval Scientific Writings in Latin (Revised ed., London 1963).

²¹Ernest Zinner, Verzeichnis der astronomischen Handschriften des deutschen Kulturgebietes (Munich 1925).

Alfred Cordoliani spent many years reviewing computistical material, but he was forced to confess: "Ma quête des manuscrits est loin d'être achevée"²²; and the results of this quest are scattered through a number of diverse journals, which have sometimes proved difficult to procure. The long-awaited catalogue of computistical treatises promised by W.M.Stevens has still not appeared.²³

A further pressing need is for the accumulation of careful, authoritative editions of individual treatises which may form the basis of a history of computus in the Middle Ages. The situation at the moment is chaotic. Good modern editions exist of some works; there are less reliable older editions of others. Some treatises are contained in early printed editions; yet others, including some of the most important, exist only in MS form. I propose in the last section of this chapter to list in chronological order individual treatises on the computus, describing the form in which they are at present available.

Just as Bede was the foundation of all the computistical treatises of the Middle Ages, so the standard for any modern

²²Alfred Cordoliani, "Contribution à la littérature du comput ecclésiastique au Moyen Age", Studi medievali ser.1,1 (1960), 107.

²³See Rabani Mogontiacensis Episcopi De computo, ed. W.M.Stevens (Corp. Christ. Cont. Med. 454, Turnholt 1979), p.167n. Dr Stevens told me in correspondence that his work on the Catalogue had been stolen from a car in Milan, and he has had to begin again.

editor must be C.W.Jones's monumental edition of Bede's treatises on time.²⁴ The reader is provided not only with an accurate text, but with essential information for the early history of the calendar. An earlier volume by Jones had cleared the way for his edition of Bede's treatises.²⁵ In it he examined the works printed by Migne in Volume 90 of the Patrologia Latina and distinguished those which were authentic from those which had become associated with Bede's name.

It has been suggested recently that Jones's brilliance has led to an undeserved neglect of earlier Irish material.²⁶ Dáibhí O Cróinín, who made the suggestion, has done much to put matters right.

The Computus of Rabanus Maurus (c.820) has been edited by W.M.Stevens.²⁷ Stevens's introduction to the treatise contains useful information about the study of computus in the monastic schools. The text itself, however, which is in question and answer form, derives mainly from Bede, and does not seem to have been an important part of the computistical tradition which was eventually to produce the Computus

²⁴Ed.C.W.Jones, Beda Opera de Temporibus (Cambridge, Mass. 1943).

²⁵C.W.Jones, Beda pseudepigrapha, (New York/London/Oxford 1939).

²⁶Dáibhí O Cróinín, De ratione computandi, (Studies and Texts 86, Pont.Inst.Med. Studies 1988), p.102.

²⁷ Rabani Mogotiacensis Episcopi De computo, ed. W.M.Stevens (C.C.Cont.Med.44, Turnholt 1979).

ecclesiasticus.

The Liber de computo of Helperic (c.900) was printed by Migne.²⁸ The treatise is more interesting than Manitius thought.²⁹ It exists in a great number of MSS and was widely cited by later computists. A new edition would be very valuable.

Abbo of Fleury (c.945-1004) wrote much on the liberal arts. In 986 he was sent to teach astronomy and computus to the monks of Ramsey. What Jones described as "Abbonian material" survives in different forms in many different MSS. Material of this kind was printed by Migne amongst works attributed to Bede, and identified by A. van de Vijver.³⁰ Towards the end of his life Abbo wrote two letters about the Dionysian era; the second of these was printed by A.Cordoliani.³¹ Abbo's pupil at Ramsey, Byrhtferth, wrote a treatise which found an editor more for its originality of style than of content, since it was written in a mixture of Latin and Old English.³²

²⁸Helpericus, Liber de computo, PL 137, 18-48.

²⁹M.Manitius, Handschriften antiker Autoren in mittelalterlichen Bibliothekskatalogen I (Leipzig 1935), 449. See below, pp.319ff.

³⁰A van de Vijver, "Les oeuvres inédites d'Abbon de Fleury", Revue Bénédictine 47 (1935), 150.

³¹A.Cordoliani, "Abbon de Fleury, Hériger de Lobbes et Gerland de Besançon sur l'Ere de l'Incarnation de Denys le Petit", Revue d'Histoire Ecclésiastique 44 (1949), 476-480.

³²Byrhtferth's Manual, ed. S.J.Crawford, (E.E.T.S. 1929). The second volume of the edition, which should have contained explanatory material, unfortunately did not appear.

"Byrhtferth's diagram", which is missing from the sole known MS of his treatise, appears in an early twelfth century codex, Oxford MS St John's 17. The latter was the basis of Faith Wallis's interesting examination of what she describes as a "computistical encyclopaedia".³³

Two treatises which appear to have had no direct influence on the work which is the subject of this edition, but which are important as products from within the Lotharingian sphere of influence, are the Compotus of Hermann of Reichenau (1013-1054), which remains unprinted,³⁴ and the Liber decennalis, now attributed to Sigebert of Gembloux (c.1030-1112), and recently edited with a splendid introduction by Joachim Wiesenbach.³⁵

The Compotus of Gerland, which can be dated to 1081,³⁶ is also unprinted, despite frequent citation in later treatises.³⁷ No history of compotus can be of value unless

³³Faith Wallis, MS Oxford St John's 17: a medieval MS in its Context (Ph.D.thesis, Toronto 1985).

³⁴A recent article on this work, which I have not seen, is by Werner Bergmann: "Chronographie und Komputistik bei Hermann von Reichenau", in Historiographia medievalis. Studien zur Geschichtsschreibung und Quellenkunde des Mittelalters. (Festschrift für Franz-Josef Schmale, 1988).

³⁵Sigebert of Gembloux, Liber Decennalis, ed. Joachim Wiesenbach (MGH Quellen zur Geistesgeschichte des Mittelalters 12, Weimar 1986). See pp.333ff.

³⁶See below, p.56.

³⁷It exists in numerous MSS. I have examined Oxford, Bodl. MS Digby 56; Oxford, Bodl. MS Auct.F.1.9; Dublin, Trinity MS 207 (incomplete).

this influential work is thoroughly examined and its contents properly evaluated.

A rather undistinguished work that cites Gerland, the Compoz of Philip of Thaon, which was dated by C.H.Haskins to 1119, was described by him as "the earliest monument of Anglo-Norman literature"³⁸. It was printed in the last century by Thomas Wright.³⁹

Honorius Augustodunensis (fl.1098-1140) was a prolific if not profound writer with English connections. According to its editor, the Imago mundi of Honorius may have been written in England. Book II contains calendar material which has some interesting bearings on the treatise which is the subject of this edition.⁴⁰

The Computus emendatus of Reiner of Paderborn was dated by its editor to 1171.⁴¹ W.E.van Wijk tells us that he has found no mention of Reiner's treatise in computistical works, and in its comparative lack of citation or of verbal parallel with

³⁸Haskins, Studies, p.336.

³⁹Philippe de Thaon, Compoz, ed. Thomas Wright, Popular Treatises in Science (London 1841), pp. 20-73.

⁴⁰Honorius Augustodunensis, Imago mundi, ed. V.I.J.Flint, Archives d'Histoire Doctrinale et Littéraire du Moyen Age 49 (1952), 92-123. See below, p.166, for connections with the Computus ecclesiasticus.

⁴¹W.E.van Wijk, Le comput emendé de Reinherus de Paderborn (1171), (Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen, afd. Letterkunde, nieuwe reeks deel 57/3), 6.

earlier treatises it appears to lie outside the computistical tradition. It is interesting because of its deliberate use of Arabic numerals:

In designatione numerorum, figuris plerumque utimur aliis quam latinis, propter scribendi et computandi compendium⁴²

and because of the writer's knowledge of the contemporary Jewish calendar.

Reiner's Jewish interests were shared by the writer of an important unpublished treatise which contains the annus presens 1175, and which has been attributed to a certain "Constabularius". This work, and the Compotus of Roger of Hereford, which dates from the following year, and which is also unprinted, are described in some detail in the course of this dissertation.⁴³ They are the most elaborate and interesting of all the post-Bedan treatises I have seen, and it would be a difficult but most rewarding task to edit them.

The main argument of this dissertation is that around the beginning of the thirteenth century new treatises on the compotus were produced for the quadrivium of the University Arts Course. Of these "Schools texts", only the Massa compoti

⁴²Le comput emendé p.10.

⁴³See below, pp.47ff; 61ff.

of Alexander de Villa Dei has been published. It was printed by R.R.Steele mainly from BL MS Egerton 2261;⁴⁴ but he did not intend to produce a critical text. It was later edited by W.E.van Wijk.⁴⁵ Van Wijk's edition contains much useful explanatory material, but his choice of MSS was arbitrary, and some of his conclusions are rather idiosyncratic.⁴⁶

The Compotus ecclesiasticus which is the subject of this edition has not been identified or printed elsewhere, so far as I am aware; nor have the other treatises which make up this group, those attributed to Master William, Conrad of Strasbourg and Peter of Berne. They are described in some detail in the course of this dissertation.⁴⁷

Other treatises present problems. C.H.Haskins cited a Compotus Petri of 1171.⁴⁸ I have not examined this treatise. Could it be identical with the Compotus of Peter of Berne? Haskins also mentioned a treatise of Michael of Dover, but Cordoliani

⁴⁴R.R.Steele, Opera hactenus inedita fratris Rogeri 6 (Oxford 1926), 268-289.

⁴⁵W.E.van Wijk, Le Nombre d'Or: Étude de Chronologie Technique (The Hague 1936).

⁴⁶Le Nombre d'Or p.48: "Le choix des manuscrits sur lesquels j'ai établi cette édition été dirigé par le hazard seulement". For his views on the golden number, see later, pp.370ff.

⁴⁷See pp.35-39.

⁴⁸C.H.Haskins, Studies, p.86 cites two MSS, Bibliothèque Mazarine MS 3642, fols. 13-13v, and BN MS lat. 2020, inc. Sunt in aliis artibus. This is not the incipit of the treatise ascribed to Peter of Berne in Oxford MS Can.Misc.71.

showed that the latter is actually the Liber de computo of Helperic.⁴⁹ Other treatises which I have not been able to investigate, but which probably date from later than the Computus ecclesiasticus, appear in Thorndike and Kibre's Catalogue. They include those of John of Brunswick and John of Pulcro-Rivo.⁵⁰ A treatise which has been printed, and which was much commented upon by later writers, is the Computus manualis of Anianus.⁵¹ Smith assigned it to the latter half of 13th century, although its content might suggest that it belonged to a much earlier period.

The reception of scientific texts from Arabic sources marks a division in the history of Computus. It is not a clear-cut division: as will be shown, the influence of the "new science" is evident before the close of the twelfth century.⁵² But as the thirteenth century progressed, the new material was more fully assimilated. The De anni ratione of John of Sacrobosco contains material of this kind. Sacrobosco's treatise appears in many MSS, and it was one of the earliest printed texts. It is the only one of the works which can be ascribed with

⁴⁹Alfred Cordoliani, "Un MS de comput et d'astronomie du xii-xiv siècle. Le MS de l'Université de Glasgow", Scriptorium 3 (1949), 71.

⁵⁰Thorndike and Kibre 41 list a Compilatio elucidans compotum manuaem by John of Pulchro Rivo, composed at Paris in 1289. The same entry credits John of Brunswick with a Computus ecclesiasticus.

⁵¹Anianus, Computus manualis, ed. D.E.Smith, Le Comput manuel de Magister Anianus (Paris 1928, repr. Geneva, Slatkine, 1977).

⁵²See pp.57ff.

certainty to Sacrobosco which has not received a modern edition. It is printed from Philip Melanchthon's 1538 Wittenberg edition as an appendix to the present dissertation. Its similarities to the Compotus ecclesiasticus are obvious. A re-evaluation of Sacrobosco's work becomes imperative.⁵³

It has been noted already that Robert Grosseteste wrote on the Compotus. Many of the great bishop's writings have been, or are, in the process of being edited.⁵⁴ The Compotus correctorius (the only calendar treatise that can be ascribed definitively to him⁵⁵) was printed by Steele, but not edited by him.⁵⁶ I would argue that it needs to be studied in the context not only of Grosseteste's own writings, but also in relation to the computistical tradition of which it is in some sense the culmination.

Roger Bacon and Campanus de Novara both mention Grosseteste with approval in the course of their own computistical treatises. The Compotus of Roger Bacon (1266) was edited by R.R.Steele.⁵⁷ The Compotus maior of Campanus (1270), a less

⁵³See below, pp.107ff.

⁵⁴This process is usefully being documented by Professor McEvoy in the Bulletin de Théologie Ancienne et Médiévale.

⁵⁵See below, pp.73ff.

⁵⁶R.R.Steele, Opera hactenus inedita fratris Rogeri 6 (Oxford 1926), 212-267.

⁵⁷Roger Bacon, Compotus, ed. R.R.Steele, Opera hactenus inedita fratris Rogeri 6 (Oxford 1926).

interesting work, awaits a modern edition.⁵⁸

In conclusion may be mentioned the works of two writers, Vincent of Beauvais and Gulielmus Durandus, who were compilers rather than innovators. It is not surprising that the huge encyclopedic work of Vincent de Beauvais has not found a modern editor, despite B.L.Ullman's promise.⁵⁹ Book XV of the Speculum naturale (1250) contains computistical material, which I could study only in an inaccurate edition of 1591.⁶⁰ Book VIII of the Rationale divinorum officiorum (1286) of Durandus also contains computistical material, but it has not been printed since the seventeenth century.⁶¹

It is only too obvious that much work in cataloguing and identifying treatises remains to be done. On the evidence of what can be known or inferred from the texts that are available to me, I shall attempt in the next chapter to show how compotus, having occupied an honourable position in the monastic curriculum, became part of the liberal arts syllabus in the thirteenth century Schools of Oxford and (probably unofficially) Paris.

⁵⁸Computus maior Campani Novariensis was printed in Venice in 1518.

⁵⁹B.L.Ullman, "A project for a new edition of Vincent de Beauvais", Speculum 8 (1933), 312-326.

⁶⁰Vincent of Beauvais, Speculum Naturale Lib.XV (Venice 1591).

⁶¹The Rationale divinorum officiorum of Gulielmus Durandus was printed in a corrected version in Venice in 1608.

Chapter II.

Computus in the Monasteries and in the Schools.

In 789, the Admonitio generalis of Charles the Great ordered that computus, together with the Psalms, writing, singing, grammar and "carefully edited catholic books" should be taught in all the schools administered by monasteries or cathedral sees.¹

In the early part of the fourteenth century, computus appears in a different kind of curriculum, that of the Oxford University Arts course: before 1350, regulations laid down that those incepting as Bachelors of Arts must have heard, as well as the six books of Euclid, and the Arithmetica and Topica of Boethius,

Computum cum algorismo, et tractatum de spere.²

What was computus doing in the University curriculum, and how and when did it get there? Why, indeed, should this essentially applied science have found its way into the generally theoretical liberal arts course?

¹MGH Legum sectio II, Capitularia I,1, p.60: ut scolae legentium puerorum fiant, psalmos, notas, cantus, computum, grammaticam per singula monasteria vel episcopia et libros catholicos bene emendate.

²Statuta Antiqua Universitatis Oxoniensis ed Strickland Gibson (Oxford 1931), p.26.

1. Compotus in the monasteries.

In Western Christian Europe, it was the monasteries which provided the earliest environment for the study of the Calendar. Those who lived within the walls of the monasteries were marked off sharply from the secular world outside by their attitude to time. In a rural society, people have little need of an accurate way of measuring time. The divisions of day and night, the changing shape of the visible moon, and the alterations of the seasons, are adequate guides to its passing. The word which has survived into modern English as "fortnight", and the now defunct "se'ennight", and their equivalents in other Germanic languages, are evidence that our ancestors marked the passage of time by the succession of nights rather than of days. Roger Bacon, writing in 1266, takes it for granted that a knowledge of the moon's phases is commonplace: the Church has got them wrong, he says, and every peasant - quilibet rusticus - can contemplate the error in the sky.³ The passing of the months was marked by the seasonal activities appropriate to each. These often appear in the traditional illustrations that accompany the calendar, or in the rhyme that encapsulates these, which is to be found, amongst other places, in the Massa compoti of Alexander de Villa Dei:

³Opus maius ed. J.H.Bridges (Oxford 1897), p. 276: Etiam quilibet computista novit, quod fallit primatio per tres dies vel quatuor his temporibus, et quilibet rusticus potest in coelo hunc errorem contemplari

Pocula Janus amat et Februus "algeo" clamat,
Martius arva fodit, Aprilis florida prodit,
ros et fros nemorum Maio sunt fomes amorum,
dat Junius foena, Julio resecatur avena,
Augustus spicas, September colligit uvas,
seminat October, spoliat virgulta November,
quaerit habere cibum, porcum mactando, December.⁴

The main events of the solar year - the equinoxes and solstices - were marked by ceremonies which had been taken over and sanitized, sometimes not very successfully, by the Christian Church - witness the complaint of Sicard of Cremona (1160-1215), writing about St John's Eve (24 June), and explaining why Vigils have had to be abandoned:

Once it used to be the custom for men to come to the church with their wives and daughters on Saints' Days, and spend the night there with lanterns ... But because it happened frequently in these Vigils that virgins were corrupted, and had too great an opportunity for wrongdoing, the Vigils were converted into fasts.⁵

Of course, by the 12th and 13th centuries - the period to which the Compotus ecclesiasticus belongs - society had

⁴Alexander de Villa Dei, Massa compoti, ed. W.E. van Wijk, Le Nombre d'Or: Etude de Chronologie Technique (The Hague 1936), p.54.

⁵ Sicard of Cremona, Mitræle, PL 213, 451C.

become increasingly urbanised and laicised, and accurate time-keeping had become important for many people - lawyers, for instance. The 13th century compilation that goes under the name of Bracton contains an interesting query: "If a man is to be excused appearing in a court for a year, how is that time to be computed in a leap-year?" The way this is handled shows an impressive grasp of computistical lore (the compiler decides on the "natural year" of 365 and a quarter days; but Henry III rejected this as too complicated).⁶

For one group of men, however, accurate time-measurement had always been essential. These were the regular clergy. The Benedictine Rule enjoined on its adherents the observance of the Canonical Hours (not necessarily a hardship - for Bede it was the time when he met the angels)⁷. In early times, this entailed a careful watching of the stars, according to a method laid down by Gregory of Tours.⁸ Later, water-clocks - horologia - were available

⁶See Fritz Schulz, "Bracton as computist", Traditio 3 (1945), 291.

⁷ Alcuin, Epistulae, ed E Dümmler, M.G.H. Ep. Karolini Aevi II (1895), 443 (Alcuin to the monks of "Wiremuthensis"): Sed et angelorum visitationes loca sancta frequentare non dubium est. Fertur enim magistrum nostrum et vestrum patronum beatum dixisse Baedam: "Scio angelos visitare canonicas horas et congregationes fraternas; quid si ibi me non inveniunt inter fratres? Nonne dicere habent: "Ubi est Baeda? Quare non venit ad orationes statutas cum fratribus?"

⁸ See S.C. McCluskey, "Gregory of Tours, monastic time-keeping, and the early Christian attitude to astronomy", Isis 81 (1990), 9-22.

for time-keeping: in 1091, Walcher of Malvern was in Italy when he saw an eclipse; he could not note the exact timing of the event because the moon was obscured by clouds, and because he had no horologium (incidentally, his account of his observations contains the first recorded use, in 1092, of an astrolabe in these islands).⁹ It is perhaps not surprising that Richard of Wallingford, the 14th century astronomer, who invented a famous clock, was a Benedictine monk.¹⁰

The Benedictine Rule ensured that those who practised it were aware of the hourly passing of time, and the Rule itself, with its emphasis on manual labour, may have been an impetus to the early interest in technology which has been attributed to the Order.¹¹ Moreover, monks had an interest in calendrical time, because it was part of their job to observe not only the Feasts of the Church, but also Year's Minds. To make possible the workings of the Ecclesiastical Calendar, it has to be assumed that the divisions of time are regular. This was not the experience of unlearned people in the Middle Ages: if a sun-dial is used to measure time, daylight hours are longer in the summer than in the winter; and the length of night and day

⁹ See C.H.Haskins, Studies in the History of Medieval Science, pp.114-115, where Walcher's account is printed.

¹⁰ See J.D.North, Richard of Wallingford, (2 Vols., Oxford 1986).

¹¹ See Lynn White Junior, "Cultural climate and technological advance", reprinted in Medieval Technology and Social Change (Oxford 1962), especially 244-266.

vary at different times of the year.¹² But measuring time in this way would have made life intolerably complicated for monks trying to say their office, particularly if they were of the Cluniac persuasion. So day and night were assumed to be of equal length, as at the equinox. Monks thus early had an understanding of the dies naturalis, the day that consists of 24 hours of equal length, as opposed to the dies artificialis, which is "as long as the sun is in our hemisphere"¹³.

It was in this monastic environment that computus first flourished. But in what sort of way was it taught? There are two schools of thought about this, the proponents of which may be exemplified by M.L.W. Laistner and his pupil C.W. Jones. Laistner assumed that the seven liberal arts of classical antiquity, handed down to the early Middle Ages in the works of Boethius, Cassiodorus and Martianus Capella, formed the framework of the monastic curriculum, as they did of the later University Schools. But as Laistner warns us, "precise information about educational practice" in the 9th century is lacking,¹⁴ and the evidence that he adduces from MS collections - like that, for example, in the monastery of St Gall - could equally well

¹²Thus Bede, DTR p.183: si omnes anni dies duodenis horis putentur, aestivos necesse est dies longioribus, brumales vero brevioribus horis includi.

¹³ Computus ecclesiasticus p.199: quamdiu sol est in nostro emisperio.

¹⁴M.L.W. Laistner, Thought and Letters in Western Europe (rev. ed., Cornell U.P., 1957), p.207.

be used to bear out Jones's theory.¹⁵

C.W.Jones argued that the economic collapse of the Roman Empire resulted in the disappearance of the essentially secular schools of the ancient world which had supplied educated men for the Church, and that although there was some attempt to organise education on an episcopal basis, there was no viable public or episcopal tradition on which to build.¹⁶ They turned, therefore, to the monastic writers of the Insular tradition, and in particular, to Bede. This contention is borne out by the General Admonition of Charles the Great quoted above. The scheme it describes, with its emphasis on skills which would be of practical use in the cloister, was very different from that formalised by Martianus Capella, based as this was on the curriculum that had been developed in classical antiquity to prepare candidates for secular public life.

What Charles the Great's advisers found in the writers of these islands was a practical education, subordinated to the needs of the Church, to the opus Dei, "narrowly interpreted as the conduct of the Office, widely interpreted as conversatio" (in the sense in which the word is used in Phil.3,20). What was needed was grammar for

¹⁵See A.Cordoliani, "Les manuscrits de comput ecclésiastique de l'Abbaye de Saint Gall du viiiie au xiie siècle", Zeitschrift für Schweizerische Kirchengeschichte 49 (1955), 161-200.

¹⁶ Bedae opera didascalica ed.C.W.Jones, (CC Ser. Lat. CXXIIIA) vi.

understanding the Scriptures, compotus, and music - but practical cantus, not the Boethian theory of the secular schools. It is textbooks on the first two subjects - grammar and compotus - that abound in the collections described by Laistner. He describes, for instance, the library at St Gall as having "a large and miscellaneous selection of grammars and other books on the subjects of the Trivium, with a few of those on the Quadrivium". In fact, according to Cordoliani, the Abbey still possesses "an important number of computistical MSS of the High Middle Ages".¹⁷

Two treatises on the calendar are good illustrations of Jones's thesis: the Compotus of Rabanus Maurus (c.820) and that of Helperic (c.900). Both are simplified versions of Bede's great work on the calendar, the De temporum ratione, very suitable, we might think, for beginners in the subject. The Computus of Rabanus uses the dialogue form which was used before him by Alcuin, the scholar whom Charles the Great imported from York in 782 to organise his Palace School.¹⁸ The Liber de computo of Helperic was written explicitly for the younger brothers of his monastery, who had begged him to record in writing what he

¹⁷A.Cordoliani, "Les MSS de comput ecclésiastique de l'Abbaye de S. Gall", 164.

¹⁸ C.W.Jones, "An early medieval licensing examination", History of Education Quarterly 3 (1963), 19-29, shows the method in action in 809.

had taught them orally about the rudiments of the art of reckoning.¹⁹ Helperic says that he has already written on grammar, but there is no mention of other "liberal arts" subjects. The highly practical course of studies which, under Alcuin's guidance, seems to have been the norm in Carolingian schools, is in marked contrast to the classical liberal arts course, which did not concern itself with applied knowledge.

Although the monastic curriculum was applied, it was not necessarily limited. The methods used to teach it appear to have been student-, rather than subject-centred. Computus makes its first recorded appearance in University Statute, as is stated above, in Oxford in the 14th century: eight days, we are told, is to be given for its study. It is pleasant to think of earlier students in the monasteries having more time to examine MSS of the kind that Faith Wallis investigated in her thesis on St John's MS 17.²⁰ She describes it as a "computistical encyclopedia". The kernel of it is the De ratione temporum of Bede, but it contains much allied material, which no doubt could be studied by the juniores at leisure, under the guidance of more experienced seniores: English monks, we are told, learnt

¹⁹Helpericus, Liber de computo, PL 137, 19C.

²⁰ F.Wallis, MS Oxford St John's 17: a medieval MS in its context (Ph.D. Thesis, Toronto 1985)

looking over the shoulders of Irish scholars.²¹ MSS like St John's 17 are full of rule of thumb methods and doggerel, and no doubt it would have been possible for a not very intelligent monk to pick up all the calendar lore he needed from these; but Bede was scornful of the student who did not learn to reckon,²² and evidence that his own work could provide plenty of mental nourishment is to be found in the opening lines of the as yet unprinted Computus of the 11th century mathematician Gerland:

Sepe volumina domini bede de scientia computandi
replians²³

What has been described so far is a scheme of elementary education. There must always have been scope, where texts and scholarship permitted, for studies outside the confines of the curriculum appropriate to the opus Dei. The classical curriculum had never been entirely neglected, as a passage of Bede quoted by Jones bears out:

Even today some turn away from the high region of the Word of God which they should be ascending to hear,

²¹C.W.Jones, "Bede's place in the medieval schools", in Famulus Christi: Essays in commemoration of the thirteenth anniversary of the Venerable Bede, ed. G.Bonner (London 1956), 279, quoting Bede's Ecclesiastical History III 27.

²²Bede, DTR p.224:Quod si adeo quisque deses vel hebes est ut absque omni labore computandi lunae cursum scire voluerit...

²³Oxford Bodl.MS Digby 56 170r.

and listen to the worldly fables and demonic doctrines. By reading the dialecticians, the rhetors, the poets of the gentiles, they learn to sharpen up their earth-bound cleverness, as at the forges of Philistia²⁴

In the late ninth century signs have been discerned of "an increasing familiarity with dialectic, and an awareness of its potential application to the other arts".²⁵ Interest in the liberal arts was sustained at this period by Irish scholars, many of whom were active in France between c.840 and c.880. The most important of these were Sedulius Scotus and John Scotus Eriugena: the latter wrote a commentary on the De nuptiis Philologiae et Mercurii of Martianus Capella.²⁶ The De nuptiis, which is an exposition of the seven liberal arts, was the subject also of a commentary by Remigius, who was teaching at Auxerre between 876 and 893. The term Quadrivium seems to have been used first by Boethius in the De arithmetica, but Remigius was responsible for its division into four topics:

Omnis enim doctrinae perfectio in quattuor artibus

²⁴ Bede, In Samuel (CCSL cxix) 112, quoted in C.W.Jones, "Bede's place in the medieval schools", Famulus Christi, 277-8.

²⁵G.R.Evans and A.M.Peden, "Natural science and the liberal arts in Abbo of Fleury's Commentary on the Calculus of Victorius of Aquitaine", Viator 16(1985), 112.

²⁶Margaret Gibson, "The continuity of learning circa 850 - circa 1050", Viator 6 (1975), 4-6.

continentur, arithmetica, geometrica, musica,
astronomia. Hoc est illud quadrivium sineque nulli
proponitur philosophandum.²⁷

In the tenth century, the Lotharingian Gerbert of Aurillac (Pope Sylvester II, 999-1003) was instrumental in encouraging the teaching of the whole range of liberal arts subjects;²⁸ and Abbo of Fleury, whose specific computistical interests have already been mentioned, wrote also on grammar, dialectic, arithmetic and astronomy.²⁹

Jones observed that "[Bede's] type of schooling would disappear from medieval culture because state and Church were once more in a position to take back public education from the monks".³⁰ When, at the beginning of the twelfth century, Papal reform closed the monastic schools to secular students, the monastic curriculum, with its subordination of education to the needs of the cloister, yielded place to the liberal arts curriculum of the Schools. But a note of caution has to be sounded here: despite the frequency with which the liberal arts are

²⁷Quoted by C.E.Lutz, "Remigius' ideas on the classification of the seven liberal arts", Traditio 12 (1956), 75.

²⁸See Hélène Gasc, "Gerbert et la pédagogie des arts libéraux à la fin du dixième siècle", Journal of Medieval History 12 (1986), 112.

²⁹See A.van de Vijver, "Les oeuvres inédits d'Abbon de Fleury", Revue Bénédictine 47 (1935), 125-169.

³⁰C.W.Jones, "Bede's place in the medieval schools", 275-276.

mentioned, it is probably better to visualise them as a framework into which particular subjects could be fitted - and that would depend on the availability of masters and texts - rather than as a rigid programme of education. And it is interesting to note that traces of the old curriculum are preserved in a gloss about the "four necessities" of the Church which is frequently found in a computistical context, often attributed to S. Augustine:

ut testantur sapientes, 4 sunt in ecclesia cuilibet clerico precipue necessaria, scilicet grammatica, musica, ius canonicum et computus.³¹

2. Computus in the Universities.

When computus makes its first documented appearance in University Statutes, it is as one of the texts to be studied as part of the Quadrivium at fourteenth century Oxford. For Paris, the earliest surviving official document which supplies information about quadrivial studies is a

³¹Quoted here from Oxford, Bodl. MS Digby 191, fol 70r (see below, pp.82ff). Material of this kind is often said to have had an Irish origin, and indeed this statement has a parallel in the seventh century De ratione computandi, ed. Dáibhí O Cróinín (Pont. Inst. Med. St. 1988), pp.116-7: Et hoc sciendum, quod, Augustino testante, quattuor necessaria sunt in ecclesia dei: canon divinus, in quo narratur et praedicatur vita futura; historia, in qua narrantur gesta rerum; numerus, in quo facta futurorum et solempnitates divine enumerantur; grammatica, in qua scientia verborum intellegitur". Dr O Cróinín traces this to S. Augustini Genesi ad litteram (CSEL 28/1:3); but the resemblance seems very slight. It is interesting that in the 14th century version quoted above canon divinus and historia have been replaced by musica and ius canonicum.

short list of prescribed reading drawn up in 1215 by the Papal Legate, Robert de Courçon.³² It is concerned mainly to detail what books of Aristotle are to be read (and what not). There is a passing reference to quadrivilia, but what these are we are not told, and while a 1255 Statutum in facultatis artium makes it clear that the ban on the "new" Aristotle has been lifted, there is still no mention of computus. Perhaps more surprisingly, there is no mention of any mathematical texts at all, although according to Rashdall, a notice in the book of the Chancellor of Ste Geneviève prescribes certain lectures in mathematics.³³

The earliest surviving Oxford document that contains details about set texts dates from 1268. It contains no reference to computus, although the Quadrivium seems to be well catered for, with the traditional texts and the "New Aristotle".³⁴ Computus, as stated above, first appears as a component in the arts course at some time before 1350.

The problem about these statutory documents is that they are scanty for the earliest period, and in any case, what is prescribed is not always what happens, even today. An extensive survey of MSS which could be shown to have been

³²Chartularium Universitatis Parisiensis I, ed. H. Denifle (Paris 1889), 78.

³³Hastings Rashdall, The Universities of Europe in the Middle Ages I, ed. F.M. Powicke and A.B. Embden (Oxford 1930), 444n.

³⁴Stat. Ant. Univ. Oxon, ed. S. Gibson, p.26

used by students would throw much light on actual practice in the universities. My own limited researches have yielded material which would suggest that around the year 1200 - that is, the time when the new universities were beginning to find their feet - a new kind of computational treatise began to appear, apparently written with the arts student specifically in mind.

What was this liberal arts student like? In the nature of things, academics tend to have been rather serious as undergraduates, and have sometimes, therefore, overrated the medieval student's ability. J.A.Weisheipl, for instance, suggested that the Computus correctorius of Robert Grosseteste, a mathematically advanced and not entirely orthodox work, was the "basic text" of the Oxford Arts course in the 13th century.³⁵ But 13th century liberal arts students were boys of perhaps fourteen or fifteen, and a glance through Emden's Biographical Register of the University of Oxford will show what they were capable of getting up to. Grosseteste's letters contain evidence of his attitude to one such student, who was presented to him as a candidate for a benefice:

He is too young and too illiterate, a mere boy indeed,

³⁵ J.A.Weisheipl, "Curriculum of the Faculty of Arts at Oxford in the early 14th Century", Medieval Studies 26(1964),172

still trying to master Ovid³⁶

- still, that is, struggling with the Trivium. It was for students like these, no doubt, that the writer of the Ecclesiastical Compotus put in bits of Ovid, so that they would have something to recognise amongst the unfamiliar calculations. Neither the curriculum nor the type of student appears to have changed much over the years: the latest copy of the Compotus ecclesiasticus that I have found dates from the 15th century, and belonged to a student called John Hatfield. He decorated his copy with all sorts of doodles, which suggests that he did not take his computistical studies very seriously.

3. Compotus in the Liberal Arts Course.

It is for students of this kind, I would argue, that the Compotus ecclesiasticus which is the subject of this dissertation was written. Other texts produced more or less at the same time share some or all of its characteristics; but it is longer, more neatly structured, and it was, it would appear, more influential than the other treatises I have studied.

³⁶ Roberti Grosseteste, Epistolae, ed. H.R.Luard (Rolls Series 25, 1861), xvii, p.65: ipse est minoris aetatis et literaturae minus sufficientis, puer videlicet adhuc ad Ovidium epistolarum palmam porrigens.

Of these, only the Massa compoti of Alexander de Villa Dei has been published.³⁷ It appears in numerous MSS from the thirteenth century on: W.E.van Wijk found ninety, but said that his list was far from complete.³⁸ Alexander's work covers much the same ground as the Compotus ecclesiasticus, but apart from the prologue it is written in verse, and is concerned with practice rather than theory. Alexander makes no claim to originality in his treatise: his book takes its name from the fact that it is put together from the works of many others, he says, just as in a furnace one lump is made out of many layers of bronze.³⁹ Nevertheless, a valuable distinction is made in the prose prologue which precedes the calendar verses: the Compotus philosophicus, Alexander tells us, deals with the accurate division of time; the Compotus ecclesiasticus is concerned with Church usage.⁴⁰ It is a distinction which becomes a computistical commonplace in later Compoti, but I have not found it in earlier treatises. Apart from this, if the student needed to understand the principles of compotus, he would have

³⁷Alexander de Villa Dei, Massa compoti ed. W.E.van Wijk, Le Nombre d'Or Etude de Chronologie Technique (The Hague, 1936); printed also by R.R.Steele, Opera hactenus inedita fratris Rogeri 6 (Oxford 1926), 268-289.

³⁸Le Nombre D'Or p.47.

³⁹Massa compoti p.52: Et quoniam de pluribus aliorum operibus liber iste colligitur, sicut de multis laminis aeris in conflatorio una massa efficitur, ideo librum istum vocare volui MASSA COMPOTI.

⁴⁰Ibid: Compotus philosophicus est scientia temporis discretiva infallibilis, compotus vulgaris sive ecclesiasticus est scientia temporis discretiva secundum usum ecclesie.

been better served by the Computus ecclesiasticus.

Biographical details for Alexander are scanty. He appears to have been born in Normandy around 1170, to have attended the Schools in Paris, and to have become tutor to the nephews of the Bishop of Joll.⁴¹ In this post he seems to have practised his particular skill: the production of liberal arts texts in a metrical form, containing information of unimpeachable orthodoxy. His Doctrinale was a basic primer for the Trivium. Later he produced the Ecclesiale, which is a Cisiojanus (a list of Saints' Days throughout the year) with added calendar reckoning and instructions for the Divine office.⁴² As well as the Massa compoti, he was the author of a very popular treatise on another topic of the Quadrivium, the Carmen de Algorismo.⁴³

As has been said, Alexander's distinction between the two types of computus is found in many later treatises. It appears at the beginning of the Computus of Conrad of Strasbourg:

Computus est scientia distinguendi tempus certa

⁴¹Le Nombre d'Or, p.47.

⁴²Alexander de Villa Dei, Ecclesiale, ed. L.R.Lind (Lawrence 1958).

⁴³Alexander de Villa Dei, Carmen de Algorismo, ed. R.R.Steele in The Earliest Arithmetics in English (EETS 1921).

ratione. Est autem duplex compotus. Philosophicus compotus est scientia temporis discretiva infallibilis. Vulgaris sive ecclesiasticus compotus est scientia discretiva secundum usum ecclesie, et de eo compoto hic intendimus.⁴⁴

C.H.Haskins did not record this Compotus, which seems to exist in a single thirteenth century MS, but J.D.North describes Conrad, about whom nothing else is known, as "writing in the year 1200".⁴⁵ The content of the treatise would suggest a date of this kind, or perhaps later, although the annus presens which could be inferred from one passage is 1080.⁴⁶ This is obviously not right, since the Compotus of Gerland is cited, and the earliest possible date that has been suggested for this work is 1081.⁴⁷ The text, in fact, seems to be derivative, containing echoes of the Compotus ecclesiasticus, the Massa compoti, and a text which has yet to be described, the Compotus of Roger of

⁴⁴Bruges MS 528 fol.1r.

⁴⁵J.D.North, "The Western calendar - intolerabilis, horribilis, et derisibilis; four centuries of discontent", in Gregorian Reform of the Calendar, ed. G.V.Coyne, M.A.Hoskin and Olaf Pedersen, (Pontificia Academia Scientiarum, Vatican 1983), 80.

⁴⁶Bruges 528 fol.1v: Unde semper in quinque annis erramus in una hora, in centum et viginti annis uno die: unde a tempore Christi usque ad hoc tempus fere novem dies excreverunt.

⁴⁷See below, p.56.

Hereford.⁴⁸

I have argued that the introduction of compotus into the Quadrivium was an impetus to the production of treatises on the subject. It is difficult sometimes to decide whether these are independent texts, or compilations from other writers, particularly in view of the loose structure to which the topic lent itself. A work entitled Compotus de arte astronomia, ascribed to Master Peter of Berne, seems to derive in part from Conrad's treatise. It is to be found in the same thirteenth-fourteenth century MS, apparently of Spanish origin, as a much more carefully written copy of the Compotus ecclesiasticus.⁴⁹ It is in a different hand, and presumably the mistakes in it should be put down to an ignorant copyist, rather than to Master Peter himself: bissextum is misspelt as bixestum, and there are mistakes in arithmetic.⁵⁰

At one point in his treatise, Master Peter appears to be quoting from the Compotus of Master William. This is the earliest of the "Quadrivium texts" that I have been able to identify. It has the incipit Annorum duo sunt genera, and

⁴⁸See below, pp.49ff. Bruges MS 528 fol.6r contains a reference to Gerland, and a table comparing the length of lunation according to the Latins, Hebrews and Chaldeans which appears in Roger's work on MS Digby 40 fol.48v. If Conrad had seen Roger's treatise, it provides evidence, otherwise scanty, of the influence of the latter writer.

⁴⁹Oxford MS Can.Misc.71, 31v-40v.

⁵⁰See below, p.349.

occurs in two MSS.⁵¹ Haskins described it as the Summa magistri Wilelmi de compoto, apparently taking the title from the Paris MS. In Digby 56, it is untitled and unascribed, and as Schulz points out, ends not at fol.219v, as Haskins suggests, but at fol.217ra, 217rb-219v being occupied by a Summa de compoto ecclesiastico.⁵² The treatise contains the annus presens 1163. Haskins took the date he ascribed to the treatise, 1164, from the following work, fol.219.⁵³

A particular problem of structure is presented by the last section of the treatise, De iiii^{or}anni distinctionibus. At the beginning of the treatise, the writer sets out the way in which he intends to deal with his subject:

prius atque dicendum est de hiis que attinent ad solarem annum, posterius de hiis que ad lunarem annum pertinent.⁵⁴

He sustains this plan, explaining some additional observations about indictions in the following way:

dicendum est de indictionibus non quia ad hanc artem

⁵¹Oxford, Digby MS 56 fols.212ra-217ra; Paris, BN lat.10358 fols.273v-283v.

⁵²Fritz Schulz, "Bracton as computist", Traditio 3 (1945), 270.

⁵³Haskins, Studies, p.86.

⁵⁴Digby 56 fol.212ra.

aliquid spectent, sed quia ad determinandum certum
tempus in quo aliquis actio factus fuit solunt notari
anni dominici.⁵⁵

But the passage which occurs at the end of the treatise,
about the four seasons, belongs manifestly not to the
lunar, but to the solar year. It is also, as we shall see,
inaccurate in what it has to say about the length of the
tropical year.⁵⁶ This is the passage which appears to be
cited by Peter of Berne. It appears also in a collection of
calendar extracts in Cashel MS 1.1⁵⁷ Perhaps it is not an
integral part of Master William's Treatise.⁵⁸

There is not room in this dissertation for a close
examination of all these texts. Attention will be drawn in
the Commentary to the Compotus ecclesiasticus to specific
parallels between it and the other treatises described in
outline above. But it is noteworthy that they all, with the
exception of the Compotus of Master William, appear to date
from 1200 or sometime later; and that they all show
evidence of Arabic scientific ideas. At the same time, they
all use the old reckoning of moments and atoms, rather than
minutes and seconds, the introduction of which was

⁵⁵Digby 56 fol.216rb-va.

⁵⁶See p.343.

⁵⁷Cashel MS 1 p.5-6: De solsticiis et equinoctiis.

⁵⁸I have not examined the Paris MS, which might very
well throw some light on this.

accredited to John of Sacrobosco.⁵⁹ In particular, the treatises offer a similar solution to the problem of the length of the tropical year - in the case of the Digby treatise, perhaps not integral to the text, and insufficiently understood.

There are, moreover, certain characteristics of these texts which might make them especially appropriate for the liberal arts student. They are relatively simple in structure and content, especially when compared with the treatises of Gerland, Roger of Hereford and "Constabularius", which will be described below; and all make use of mnemonics and the techniques of the computus manualis, aides-memoires that must have greatly benefited the less motivated student. A particularly attractive feature of the Computus ecclesiasticus is that it quotes from texts which must have been familiar to the student from his study of the Trivium. Alexander de Villa Dei disapproved of the use of the Fasti in teaching calendar subjects,⁶⁰ but the practice of quoting Ovid was followed by Conrad of Strasbourg and Peter of Berne, as well as by John of Sacrobosco.

One of the innovations of the twelfth-century Schools was the development of the accessus. It derived ultimately from

⁵⁹See below, pp.112-113

⁶⁰See below, p.127.

Boethius's division of knowledge in the De differentiis topicis:

Dicemus igitur de genere artis et speciebus et materia et partibus et instrumento intrumentique partibus, opere etiam officioque auctoris et fine.⁶¹

It was a method of commentary on an author which was applied in the first place to Trivium texts.⁶² It is interesting to find the same technique applied by the fourteenth century Master Conrad to the Compotus ecclesiasticus and the Massa compoti.⁶³

It is impossible, given the paucity of information about the writers of these treatises, to show how they are related to each other. It is particularly puzzling that Alexander de Villa Dei, who appears to have spent all his life in France, should have produced two treatises for the Quadrivium when neither Compotus nor Algorism appear to have been Schools subjects in Paris at this time. It is not, I would argue, in Paris that we shall find the answer to how compotus became part of the liberal arts curriculum.

⁶¹Boethius, De differentiis topicis (PL 64, 1207A-B), quoted in R.W.Hunt, "The introduction to the Artes in the twelfth century", Studia medievalia in honorem R. J. Martin (Bruges 1948), 87.

⁶²See E.A.Quain, "The medieval Accessus ad auctores", Traditio 3 (1945), 261-2.

⁶³See below, p.80.

4. Quadrivial Studies in Paris.

Some evidence as to what was being studied at Paris at the end of the twelfth century was adduced by C.H.Haskins, who drew attention to a late 12th century treatise which goes under the title Sacerdos ad altare. This contains a list of text-books which Haskins regarded as "an unofficial enumeration of the books then in use in the schools of Paris". Remembering the sort of student it was designed for, it is a relief to read:

Absint flagella et scorpiones, ne modum excedat
castigando⁶⁴

The word Quadrivium does not appear, but the traditional texts for arithmetic, music and geometry - Boethius and Euclid - are listed, and some newer texts - Ptolemy and Alfraganus - for astronomy. Haskins believed that the compiler of this list was the twelfth century English scholar Alexander Neckam. If this is so, it is significant, as we shall see, in the light of the latter's later career.

Alexander's treatise is evidence that quadrivial subjects, mainly of a traditional kind, were being studied; but Daniel of Morley, an Englishman who went to Spain and came back with "a precious multitude of [scientific] books"

⁶⁴Haskins, Studies, p.372.

found nothing to detain him in Paris.⁶⁵ There must, however, have been some advanced mathematical studies going on somewhere: although Roger Bacon deplored the lack of scientific studies at Paris, he named Pierre de Marincourt as one of the two great mathematicians of the 13th century.⁶⁶ And if we consider the last topic of the Quadrivium, astronomy, it is interesting to note that in the previous century, one of the odder things which that very odd man Peter Abelard did was to call his son Astrolabe. Again, when Robert Grosseteste wrote about the calendar, probably around 1225, he aligned his calculations with the Paris meridian.

What are we to make of this apparent contradiction? Guy Beaujouan has suggested that quadrivial studies of an advanced order were indeed to be found in Paris, but that they were pursued as a sort of extra-curricular activity.⁶⁷ More particularly, it is his thesis that the works of Sacrobosco, which include a very well-known

⁶⁵See J.C.Russell. "Hereford and Arabic Science in England about 1175-1200", Isis 18 (1932),23

⁶⁶ Opus tertium, ed. J.S.Brewer, Opera quaedam hactenus inedita (R.S.15, 1859),34-35: Non sunt enim nisi duo perfecti, scilicet magister Jo. London. et magister Petrus de Maharn-curia Picardus. It is of interest that Oxford Bodl. MS 679, which contains the copy of the Computus ecclesiasticus which is ascribed to Roger Grosseteste, was once in the collection of Johannis de London.

⁶⁷Guy Beaujouan, "L'enseignement de l'arithmétique élémentaire a l'université de Paris aux xiii et xiv siècles", Homenage a Millas-Vallicrosa I (Barcelona 1954), 93-124

Compotus, were studied in this way.⁶⁸

5. Alexander Neckam and John of Salisbury.

A comparison between two Englishmen, Alexander Neckam and John of Salisbury, may throw some light on the difference between quadrivial studies in France and England, and on how compotus came to be studied in the context of the liberal arts course.

John of Salisbury was Alexander Neckam's senior by some forty years (he was born around 1115). Both were highly educated. But John of Salisbury's experience of education was almost entirely Parisian, while Alexander Neckam, after ten years or so (1180-1190) in Paris, spent some time in Oxford before becoming an Augustinian Canon at Cirencester in Gloucestershire, and being elected Abbot of the same monastery in 1213. John was a statesman and all-round man of letters, one who, it has been said, epitomises 12th century humanism; Alexander Neckam "has long been recognised as a leading representative of the scientific current of English thought of the late 12th and early 13th centuries".⁶⁹

As I have said already, the liberal arts curriculum appears

⁶⁸See below, pp.121.

⁶⁹ R.W.Hunt, The Schools and the Cloister, (Oxford 1984), p.67

to have provided a framework rather than a rigid pattern of education in the early Schools, and John McLoughlin, in his Ph.D. thesis on John of Salisbury, holds that "John's references to the Trivium and Quadrivium are occasional and are little more than lip-service to a scheme hallowed by tradition".⁷⁰ Of course, the great strength of Paris at this time lay in logic and theology; and it appears to have been particularly the former study that attracted John of Salisbury. Nevertheless, he tells us that quadrivial subjects were studied, and that he had attended lectures on them; he even gives us the names of teachers he heard, Richard l'Évêque and a "German" called Hardewin.⁷¹ An admittedly cursory examination of his writings would suggest, however, that they had very little impact on him. There are a few references to the traditional quadrivial texts, like the De arithmetica of Boethius,⁷² and one to Bede's De temporum ratione;⁷³ but he is a quintessential arts man in the modern sense, literate rather than numerate. There is an almost total lack of astronomical

⁷⁰John McLoughlin, John of Salisbury (c.1120-1180): the Career and Attitudes of a Schoolman in Church Politics (Trinity College, Dublin, Ph.D.Thesis 1988), p.57.

⁷¹John of Salisbury, Metalogicon Book II, ed. J.B.Hall, auxiliata K.S.B.Keats-Rohan (CC cont.med. 98, Turnhout 1991), 72: Postmodum vero Ricardum cognomento Episcopum secutus sum; et que ab aliis audieram ab eo cuncta relegi, et inaudita quedam ad quadrivium pertinentia in quo aliquatenus Teutonicum preaudieram Hardewinum.

⁷² Historia pontificalis, ed. M.Chisnall, (Oxford 1986), p.32

⁷³ The Letters of John of Salisbury II, ed. W.J.Millor and C.N.L.Brooke, 322 (Ep.209).

references, and he is certainly not interested in the calendar: a remark about the Egyptians refers to fleshpots, not to their calendar skills; and Caesar is Caesar Augustus, rather than the inventor of the Julian Year.⁷⁴

If we turn to the younger man, we find a scholar of a very different kind. From 1190 on, Alexander was in Oxford, and then in Gloucestershire (although not all the while - in 1215, for instance, he attended the 4th Lateran Council). It is to this stage of his life that his scientific writings belong. The De naturis rerum is the most considerable of these, although Alexander is "careful to warn the reader not to expect a philosophical or scientific treatise He intends to write a moral treatise".⁷⁵

At some stage Alexander became interested in the problems of the calendar: in the Suppletio defectum, which was written as a revision of his earlier Laus sapientie divine, he refers explicitly to them:

Et iam vulgaris manifeste compotus errat.⁷⁶

Richard Hunt observed: "The elegiac couplet makes an

⁷⁴The use to which John put what he did know is described by G.R.Evans, "John of Salisbury and Boethian arithmetic", in The World of John of Salisbury, ed. Michael Wilks, Studies in Church History Subsidia 3 (Oxford 1984), pp.161-7.

⁷⁵R.W.Hunt, The Schools and the Cloister p.82.

⁷⁶The Schools and the Cloister p. 77.

extraordinarily obscure vehicle for conveying information on the subject", but Alexander's dissatisfaction with the present state of the calendar is clear enough.

6. Alexander and the "Hereford School".

Where did Alexander come by his interest in the calendar? The answer to this question is to be found in an article written in 1932 by J.C.Russell.⁷⁷ He showed there that Alexander was one of a group of scholars who lived in the West of England and had a connection with Hereford. Evidence for a flourishing cathedral school here is provided by Simon du Fresne, a canon of Hereford who died some time before 1224. Giraldus Cambrensis appears to have been one of the group: a poem addressed to him, possibly around 1200, describes the city as the proper home of the Trivium and Quadrivium.⁷⁸ Alexander certainly appears to have known Giraldus's work. His De naturis rerum is full of references to Ireland. Since he never came to this island, he presumably got them from Giraldus.

It is of particular interest that Alexander appears to have been a member of the learned circle that also included the computist Roger of Hereford. The little that can be deduced

⁷⁷ J.C.Russell, "Hereford and Arabic Science in England about 1175-1200", Isis 18(1932), 161-172

⁷⁸Urbs Herefordensis multum tibi competit, in qua
Propius est trivii quadrivii locus
- quoted in "Hereford and Arabic Science", 19

about Roger and his writings has been examined by Russell, and by C.H.Haskins; and Roger's astrological treatise, the Liber de astronomice iudicandi, has recently been examined by Nicholas Whyte.⁷⁹ Roger was the author of several works, none of which has been printed. The most considerable of these is the Compotus, which contains the annus presens 1176 in two places.⁸⁰ Russell summarised the evidence for the attribution of this work to Roger. Although he appears still to have been a young man when he wrote it, he tells us that he has been prevented from writing on compotus before because of all the business of teaching with which he has been wearing himself out for many years:

omnium quod mihi contingit pro regimine scholarum
quibus iam pluribus annis desudavi⁸¹

It is possible that Alexander Neckam became interested in calendar problems through his contacts with Roger. There is evidence in Roger's Compotus that the discrepancies in the calendar had become a topic of concern in twelfth-century England. In the preface which forms part of the Digby MS,

⁷⁹C.H.Haskins, Studies in the History of Medieval Science, pp.124-6; Nicholas Whyte, Roger of Hereford Liber de astronomice iudicandi: a twelfth century astrologer's manual (Cambridge M.Phil. thesis 1991).

⁸⁰Digby 40 fol.21r: ut exempli gratia circa tempus huius compositionis huius tractatus anno scilicet domini .m.c.lxxvi^o. cicli decennovenalis .xviii. que in vulgari compoto dicitur accensa .v^a. anni illius nona die septembris; fol.48r: circa tempus compositionis huius tractatus anno scilicet domini m.c.lxxvi

⁸¹Digby MS 40 fol.21r.

the controversy is discussed. The compotists are locked into internal battle among themselves. The proponents of the "natural" (or, as Alexander de Villa Dei would later define it, "philosophical") compotus reject the ecclesiastical or "popular" (vulgaris) compotus because of its lack of subtlety, and because it follows what the senses say rather than the rational truth. The proponents of the popular compotus reject the natural compotus because it is alien to the senses and clear to reason alone, a vain and empty science not visible to the eyes nor audible to the ears. Then there are treatises which do not distinguish between the two, and introduce much which is irrelevant; and others which being designed only to satisfy the need of the vulgar or ecclesiastical compotus are found to have rejected essentials.⁸²

The Compotus of Roger of Hereford exists in two MSS that I have been able to trace, Oxford MS Bodley Digby 40, fols 21-50v, dating from the late twelfth or early thirteenth century, and Cambridge University MS Kk.I.1, which dates from the thirteenth century. In the latter codex, it is unascribed: in the former, an ingenious acrostic reads

⁸²Digby 40 fol. 21r: Sed et compotista inter se tanquam intestina prelia commoventes, naturales vulgarem compotum a sua subtilitate discrepantem magisque sensuum opinionem quam rationis veritatem exequentem abiciunt. Contra vulgares naturalem a sensibus amotum solique ratione patentem vanam inanemque scientiam quam nec oculis vidit nec auris audivit appellant. Sunt et item huius scientie tractatus qui sine distinctione naturalis et artificialis compoti multa interponunt superflua. Alii vero volentes ecclesiastice vulgari consuetudine tantum satisfacere abicere necessaria inventi sunt.

GILBERTO ROGERUS SALUTES H D, and the treatise begins with a heading Prefatio magistri Rogeri Infantis in compotum. Another MS, Oxford CCC MS 233, appears also to have contained Roger's treatise: the work is cited in a list of contents in this codex, but the treatise itself is missing. It was there when John Dee owned the MS in the sixteenth century, because he listed it in his 1583 Catalogue of his Mortlake library.⁸³ Digby 40 contains other interesting material which will be referred to later. The copy of the treatise which appears in the Cambridge MS is very carefully written, but lacks the preface, the first part of which was printed by Russell from the Digby MS.⁸⁴ One interesting feature of this copy is that it is printed in Arabic numerals throughout.

It is the preface of Roger's work which is particularly relevant to the question of how compotus found a place within the quadrivium. It begins with a discussion of the seven liberal arts. Although it appears to owe something to William of Conches, the writer's emphasis is his own. For William, all seven arts are subordinate to theology: through knowledge of creation, we are led to knowledge of the Creator.⁸⁵ For Roger, in a quite revolutionary shift,

⁸³Catalogus Librorum Bibliothecae Externae Mortlacensis, ed. J.O.Halliwell, (Camden Society 19, 1842), 82.

⁸⁴"Hereford and Arabic Science", 20-21.

⁸⁵William of Conches De philosophia mundi cap.xli PL 172, 100D: Quippe cum per cognitionem creaturae, ad cognitionem creatoris perveniamus.

grammar, logic and rhetoric are a means to an end, the study of arithmetic, music, geometry, and astronomy; and even theology can learn from astronomy.⁸⁶ Particularly noteworthy is the inclusion of compotus with astronomy: evidence that at Hereford it was considered a legitimate part of the quadrivium:

Hanc tamen tante excellentie scienciam astrologi, nature superiorum secreta motumque tam celi quam stellarum certitudinem investigantes, compotumque ab illa certitudine multum discrepare repperientes, falsam ab omni philosophica disciplina abiciendam arbitrantur.⁸⁷

It is in the West of England, I would suggest, that Alexander Neckam got his calendar interests, and from a group of men who who found ideas of this kind worth studying that compotus found its way into the schools of Oxford and thence into the other universities of Europe.

7. The "Hereford School" and the Lotharingians.

Why was compotus a topic of interest in England, and particularly in the West Country, in the twelfth century? The answer lies in contacts with Lotharingia which had

⁸⁶J.C.Russell, "Hereford and Arabic science", 21.

⁸⁷Digby 40 fol.21r; printed by Russell, "Hereford and Arabic science" 21.

begun before the Norman Conquest. Reckoning skills were essential for compotus, and Liège in particular was a centre for mathematical studies. Gerbert of Aurillac and Hermannus of Reichenau, who had connections with Lotharingia, were known as "supreme masters" of the abacus.⁸⁸ Hermannus wrote an as yet unprinted treatise on compotus.⁸⁹ J.W.Thomson described the existence in tenth century Lorraine of "a congenial group of monks and clerics interested in mathematics and astronomy and music", including a mathematical nun.⁹⁰

Lotharingian science was disseminated in England by Abbo of Fleury, who taught astronomy and compotus to the monks of Ramsey from 986-988. It was during his stay at Ramsey that the uplendiscea preost Byrhtferth produced a handbook embodying Abbo's ideas in parallel versions, one in Latin for the oblates of the monastery, one in English for the unlettered clerks, finding it a rewarding task.⁹¹ Ramsey was the mother house of both Worcester and Winchcombe, and what C.W.Jones calls "Abbonian material" was transmitted

⁸⁸G.R.Evans, "Schools and Scholars: the study of the abacus in English schools c.980-c.1150" English Historical Review 94 (1979), 71.

⁸⁹See above, p.11.

⁹⁰J.W.Thomson, "The introduction of Arabic science into Lorraine in the tenth century", Isis 12 (1929), 189.

⁹¹Byrhtferth's Manual, ed. S.J.Crawford (E.E.T.S. 1929), p.15 (Crawford's translation): "Where we perceived the blossom of the lily" (that is the beauty of computation), "there we scented the perfume of roses" (that is we perceived the profundity of reckoning).... These things we found at Ramsey, by the merciful grace of God.

from Ramsey to the West Country, as the provenance of MSS like Oxford, Digby 56 shows.⁹²

Amongst works attributed to Abbo is the Compotus known as the Ephemeris,⁹³ and two letters, dating from 1003 and 1004, on the subject of the Christian era. Abbo calculated that the date of the Incarnation given by Dyonisius was 21 years too late.⁹⁴ The Irish hermit Marianus Scotus, who died at Mainz in 1082, arrived at a very similar conclusion, and it was his emendation that was accepted and added to by Robert Loring, who was Bishop of Hereford from 1079 -1085.⁹⁵

In the Lotharingian tradition, Robert was both abacist and compotist. William of Malmesbury said he was

highly skilled in all the liberal arts, especially knowledgeable about the abacus and the lunar compotus and the course of the celestial stars⁹⁶

⁹²C.W.Jones, Bedae Pseudepigrapha p.13.

⁹³PL 90, 727D-820.

⁹⁴See A.van de Vijver, "Les oeuvres inédites d'Abbon de Fleury", Revue Bénédictine 47 (1935), 155.

⁹⁵See A.Cordoliani, "L'activité computistique de Robert, évêque de Hereford", Mélanges offerts à René Crozet, ed. P.Gallais and Y.-J Rioux, (Poitiers 1966), I, 333-340.

⁹⁶William of Malmesbury, Gesta pontificum, ed. N.E.S.A.Hamilton (Rolls Ser.1870), p.300: omnium liberalium artium peritissimus, abacum precipue et lunarem compotum et celestium cursum astrorum rimatus.

The statement is evidence that for William, as for Roger of Hereford cited above, compotus is firmly established in the liberal arts curriculum.

It is interesting that the computistical tradition which is exemplified by the Compotus ecclesiasticus appears to have been transmitted from Bede via Helperic and Gerland. These latter were not the only experts on Compotus with Lotharingian connections: Hermannus of Reichenau has already been mentioned, and others will be detailed later;⁹⁷ but it was Helperic and Gerland who appear to have had specific links with England.

The Liber de computo of Helperic, the ninth-century monk of Auxerre, has already been mentioned. The earliest surviving MSS containing it date from 900 and 903, and these dates provide some evidence about when the treatise was written. It still awaits a modern editor. Manitius dismissed it as "on the whole poor". He suggested that it was because it was full of short extracts from Bede that its longevity was assured.⁹⁸ There are indeed eighty or so surviving MSS, and many of these are of English provenance.⁹⁹ In a fourteenth century commentary on the Compotus, Helperic is described

⁹⁷pp.324ff.

⁹⁸M.Manitius, Handschriften antiker Autoren in mittelalterlichen Bibliothekskatalogen I (Leipzig 1935), 449.

⁹⁹See P.McGurk, "Computus Helperici: its transmission in England in the eleventh and twelfth centuries", Medium Aevum 43 (1974), 1-5.

as quidam abbas Anglorum.¹⁰⁰

Helperic is cited by Gerland, whose Compotus again is unprinted. Gerland was born about 1055, probably at Besançon. Like other Lotharingians before and after him, he was both abacist and compotist. He wrote on other liberal arts subjects, including a Dialectica, and according to the editor of the last work, on theological subjects too.¹⁰¹ The same writer notes that Gerland is always mentioned in the same breath as Dionysius, Bede and Helperic, and postulates that he came to England in the reign of Harold I (1036-1040). Certainly, two important twelfth century MSS that contain his Compotus, Oxford, Bodl. MS Digby 56, which has been mentioned above, and Oxford, Bodl. MS Auct. F. 1. 9, which will be referred to below in connection with Walcher of Malvern, are of West of England provenance.¹⁰²

Two problems arise with regard to the Compotus of Gerland. The first is whether the original treatise consisted of one book or two. According to Alfred Cordoliani, most MSS do not have Book II, or, more exactly, they have only the first chapters of Book II, inserted into Book I in place of its last chapter. Cordoliani's conclusion was that the

¹⁰⁰Cambridge, Gonville and Caius College MS 137, fol. 41vb. See below, p.82.

¹⁰¹L.M.de Rijk, Garlandus Compotista Dialectica (Assen 1959), p.xxxvi.

¹⁰²An incomplete copy of Garland's Compotus is to be found in Dublin, Trinity 207, fols.1-13. This is a 13th-14th MS from the Benedictine Abbey of St Mary in York.

longer MSS represented Gerland's recension of his first version.¹⁰³

The second problem concerns the date of the treatise. As L.M.de Rijk pointed out, Cordoliani was mistaken in identifying the compotist with the twelfth century canon of Besançon. Cordoliani suggested that Gerland was born "towards 1100".¹⁰⁴ But as Haskins had already remarked, Gerland is cited in the Anglo-Norman Comput of Philip of Thaon, which was written in 1119.¹⁰⁵ Haskins notes the annus presens 1081 in BN MS lat.11260, but says that the passage in which it occurs may not have been integral to the text. Yet the same date occurs twice in MS Digby 56, and in the first instance at any rate seems to essential to the central argument of Gerland's treatise.¹⁰⁶

The Computus of Gerland, as its incipit which was quoted at the beginning of this chapter implies, may be viewed as a mathematically erudite and yet gracefully written commentary on Bede. It was important because it embodied the controversial ideas about the dating of the Christian

¹⁰³A.Cordoliani, "Le comput de Gerland de Besançon", Revue du Moyen Age Latin 2 (1946), 309.

¹⁰⁴A Cordoliani, "Abbon de Fleury, Hériger de Lobbes et Gerland de Besançon sur l'Ere de l'Incarnation de Denys le Petit", Revue d'Histoire Ecclésiastique 44 (1949), 469.

¹⁰⁵Ed. T.Wright as Philip de Thaun, Li livre des creatures (Popular Treatises in Science, London 1841), pp. 20-73.

¹⁰⁶Digby 56, fols. 178r, 179r.

Era which preoccupied writers from Abbo onwards. It was evidently closely studied by Roger of Hereford, who used Gerland's dating of an eclipse in comparison with one of his own time in his calculation of a mean lunation:

Tempus autem Gerlandi facta est eclipsis solis anno domini secundum ipsum .m.lxxxvi. licet tabulam sapientorum prius incepit secundum dionisium .m.xc.iii.¹⁰⁷

It is interesting that Roger, unlike two thirteenth century computists, John of Sacrobosco and Robert Grosseteste, appears to have had direct access to Gerland's text; and also, that like "Constabularius", whose treatise will be described below, he is not prepared to accept Gerland's emendation of the Dionysian Era.

8. The "Hereford School" and the New Science.

Lotharingian influence in the West of England ensured that this area provided a favourable environment for the reception of new ideas about science. Indeed, according to R.M.Thomson, the "intellectual avenue" between Lotharingia and Spain, from where many of the new ideas were to come, had never closed.¹⁰⁸ It was noted at the beginning of this

¹⁰⁷Digby 40 fol.49v.

¹⁰⁸R.M.Thomson, "The introduction of Arabic science into Lorraine in the tenth century", 184.

chapter that the first recorded use of an astrolabe in these islands was by Walcher of Malvern. Walcher was a Lotharingian. He used an astrolabe to establish the position of an eclipse which formed the basis for a set of lunar tables. Some eighteen years later, he produced a further set of tables. These used not the customary Roman fractions which still form the basis for calculation in the Computus ecclesiasticus and the other "schools treatises" which have been described in this chapter, but the minutes and seconds which would eventually supersede them.¹⁰⁹

Walcher learned about minutes and seconds from the Christian Jew Peter Alfonsi, the godson of Alfonso I of Aragon, who was possibly in England as the physician of Henry I.¹¹⁰ Walcher's tables, and Alfonsi's treatise embodying the new system of reckoning, are both to be found in Oxford, Bodl.MS Auct.F.1.9.¹¹¹ Haskins attributes to Peter "a certain share in the introduction of the Arabic astronomy into England before 1120."¹¹² How large that share was is still a subject of controversy. A Liber ysaqoqarum Alchorismi in artem astronomicam a magistro A. compositus has been variously attributed to Peter Alfonsi

¹⁰⁹See C.H.Haskins, Studies in Medieval Science, pp.114-115.

¹¹⁰Haskins, Studies, p.118-119.

¹¹¹See J.H.L.Reuter, Petrus alfonsi: an examination of his works, their scientific content and background (Oxford D.Phil.thesis, 1975).

¹¹²C.H.Haskins, Studies, p.119.

and to Adelard of Bath, but the evidence is not positive for either writer.¹¹³ The first three books of this "Introduction" deal with the new arithmetic, probably for the first time in Latin. According to Haskins, the fifth book shows "acquaintance with Hebrew chronology as well as with Arabic astronomy"¹¹⁴

Adelard of Bath was at any rate part of the same learned circle that surrounded Robert Losinga, Bishop of Hereford and Walcher, Prior of Malvern.¹¹⁵ He studied at Tours and taught at Laon before travelling to Magna Graecia, Sicily, Cilicia, Syria and perhaps Palestine. There is no clear evidence that he visited Spain, yet he translated the Khwarizmian Tables from a Spanish edition.¹¹⁶ It is possible that Peter Alfonsi was his source for this.

Two later scholars certainly travelled in Spain, and brought back new ideas to England. Daniel of Morley has already been mentioned. Between 1175 and 1189 he returned from Toledo, where he had been studying particularly under

¹¹³Haskins, Studies, p.24. A recent study has suggested that the question of authorship cannot be settled - see André Allard, "L'Époque d'Adélarde et les chiffres arabes dans les manuscrits Latins d'Arithmétique", Adelard of Bath. An English Scientist of the early Twelfth Century, ed. Charles Burnett (London, Warburg Inst. 1987), 38.

¹¹⁴Haskins, Studies, p.24.

¹¹⁵Margaret Gibson, Adelard of Bath, ed. C. Burnett p.13.

¹¹⁶Haskins, Studies, pp.33-34.

the famous translator Gerard of Cremona.¹¹⁷ His spiritual overlord was the Bishop of Norwich, and his surname would suggest that Daniel of Morley was a native of Norfolk. Although we may not feel confident, with J.C.Russell, that Norfolk is next door to Hereford,¹¹⁸ we may accept his evidence that Daniel was part of the circle of twelfth-century scholars interested in Arabic science which centred on Hereford. Another of the same circle was Alfred of Sarechel (Alfredus Anglicus). The cognomen Anglicus "suggests residence abroad", possibly in Toledo or Cordoba. Alfred refers to a teacher, who could very well have been a Spanish Jew.¹¹⁹ Finally, mention may be made of the Salernitan Questions, a collection of scientific material which appears to have been produced at Hereford at the beginning of the twelfth century. The editor of this work is of the opinion that there is "a definite link between the compiler and the circle of scholars at Hereford....the centre for study of Arabic mathematical science at that period."¹²⁰

In the West of England an interest in compotus which

¹¹⁷Theodore Silverstein, English cosmogonist and student of Arabic science", Mediaeval Studies 10 (1948), 179.

¹¹⁸J.C.Russell, "Hereford and Arabic Science in England" Isis 18 (1932), 23.

¹¹⁹J.K.Otte quotes Alfred in "The life and writings of Alfredus Anglicus", Viator 3 (1972), 281: Magister meus Salomon Avenrasa, et Israelita celeberrimus, et modernorum philosophorum precipuus.

¹²⁰Brian Lawn, The Prose Salernitan Questions (Auctores Britannici Medii Aevi V, London/Oxford 1979), p.xvi.

stretches back to Abbo at the end of the tenth century was combined with an eager reception of the new Arabic science. The kind of material which was available to a twelfth century scholar with an interest in both can be studied in the Compotus attributed to a certain Constabularius.

The identification of this treatise, which appears now to exist only in BL MS Cot.Vit.A.XII, was made by P.J.Willets.¹²¹ She drew attention to BL MS Egerton 3314, which contains some notes by a monk of Christ Church, Canterbury, in which he refers to a certain magister Cunestabilis:

Peccator ego Salomon ecclesie Christi dictus monachus, cum modernorum compotistarum diligenter scripta revoluerem, apud illos notulas repperi, quibus aliam quae ab antiquis sunt diffusius, iocunde brevitatis compendio colligantur Set et in calce huius schedule quiddam de magistri Cunestabili scriptis inserui, in quo sane contra Marianum et Gerlandum pro ecclesie de annis domini astronomicis rationibus efficaciter disputantur.¹²²

Salomon pays graceful homage to magister Cunestabilis in

¹²¹P.J.Willets, "A reconstructed astronomical MS from Christchurch Library, Canterbury", British Museum Quarterly 30 (1965-6), 22-30.

¹²²Egerton 3314 fol.1b. Quoted by Willets, p.24. I have not examined this MS at first hand.

his opening words, which reflect the opening of the latter's treatise:

Sepe autorum volumina qui de compoto vel principaliter
vel incidentaliter egerunt studio se revolvimus¹²³

- just as this writer had paid homage to Gerland, whose treatise begins, it will be remembered:

Sepe volumina domini Bede de scientia computandi
replicans¹²⁴

According to Willets, this treatise can be identified as the one that Salomon is referring to by "marginal guide letters" in the Egerton MS. Haskins, who had not had access to the latter MS, had previously noted that "three copies of a Compotus constabularii were formerly at Canterbury" without associating them with the Cottonian MS.¹²⁵

Haskins comments on the breadth of citation in the treatise, and prints the preface.¹²⁶ This reflects, as has

¹²³Cot.Vit.A.XII fol.87ra.

¹²⁴MS Bodl.Digby 56 fol.87r.

¹²⁵C.H.Haskins, Studies, p.87. There is no clue to the identity of the author in BL MS Cot.Vit.A.XII. According to Haskins (p.128), the chroniclers Roger of Hoveden and Benedict of Peterborough record the predictions made for the year 1186 by a certain William, the clerk of the constable of Chester; but it is difficult to see where this might lead, if anywhere.

¹²⁶Haskins, Studies, pp.97-98.

been noted, the opening words of Gerland's Compotus, and the writer is at great pains to stress his indebtedness to the latter. Gerland, he says, has been imitated and is to be imitated above all other authors, except where he goes against the Church; for where he writes well, no one is better. The writer emphasises his own orthodoxy in the context of the controversy which surrounds the subject. His reading has acquainted him with certain iuniores, skilled in the art of calculation, who have opposed Church usage. And there are certain moderni who applaud them, and dare to inscribe their own innovations on their Easter Tables, disregarding the footprints of the holy fathers. There are even certain hunters of novelty and wicked slanderers of antiquity who repudiate Christian doctrine and trusting in their own skill wish to think otherwise than the Church. He is encouraged by the support of the unknown friend (whom he addresses as dilectissime and to whom he dedicates his treatise) to repudiate their theories, although he would happily see his own labour ignored if those who have more skill and access to more books may be spurred on to reflect on this topic.¹²⁷

We may feel that the writer, in alluding to those with access to more books, is displaying false modesty. It is interesting, for instance, that he frequently cites Ptolemy, although Gerard of Cremona's translation of the

¹²⁷Cot.Vit.A.XII fol.87ra; quoted by Haskins, Studies, p.87.

Almagest, the most widely-known version, did not appear until 1175; this is the annus presens given three times in the present treatise.¹²⁸ The computist's references are sometimes unexpected. Haskins comments on his citation of the Digest.¹²⁹ Steele drew attention to the fact that Constabularius "knows algorism". He is referring to the writer's statement at the beginning of his treatise:

In alchoarizmo tantum accipitur pro cuiuslibet rei
.lx. parte.¹³⁰

This is not algorism in the sense in which the word was to be used later, when its connotation was arithmetical.¹³¹ And although the writer here describes the sexagesimal system of time-division, the calculations in the treatise, like those in Roger of Hereford's Computus, are carried out in the old notation. The last book of the Liber ysaqoqarum referred to above deals with astronomy, and it is presumably to this that Constabularius is referring. Sixty years later, John of Sacrobosco was to be credited with the first use of the sexagesimal system for computistical measurements.¹³²

¹²⁸BL MS Cot.Vit.AXII fols.90v, 93r, 94r.

¹²⁹Fritz Schulz, "Bracton as computist", Traditio 3 (1945), does not mention this treatise, but he quotes the relevant passages from Justinian in 281-285.

¹³⁰Cot.Vit.A.XII fol.87b.

¹³¹See pp.135ff.

¹³²See pp.112-113.

R.R.Steele made another interesting suggestion: that Constabularius "probably learned his science from Jewish sources".¹³³ There are indeed frequent references to moderni iudei, as opposed to Hebrei. Were these Jewish sources oral or written, and did Constabularius travel abroad, or did he find them in England? Beryl Smalley showed how in the twelfth century, theologians turned to Jewish exegetes in their study of Scripture. Of particular interest in the present context is the Augustinian Canon, Andrew of St Victor, who was Abbot of the Victorines' daughter house at Wigmore in Herefordshire for two periods in the middle of the century.¹³⁴ That other Augustinian with West country connections, Alexander Neckam, described himself as mediocriter etiam instructus in lingua Hebreorum.¹³⁵ But both these writers made their contacts with Jews in Northern France, where they "lived on generally friendly terms with their Christian neighbours".¹³⁶ The only topographical reference in the treatise of Constabularius is to England:

Item quandoque lune distans a sole paulominus quam

¹³³R.R.Steele, Opera hactenus inedita fratris Rogeri p.xx.

¹³⁴Beryl Smalley, The Study of the Bible in the Middle Ages (Oxford 1984), pp.149-172.

¹³⁵Alexander Neckam, De naturis rerum, ed. Thomas Wright (Rolls Series 34, 1863), pp.7f; quoted in Raphael Loewe, "Alexander Neckam's knowledge of Hebrew", Medieval and Renaissance Studies 4 (1958), 19.

¹³⁶Beryl Smalley, The Study of the Bible p.149.

xxix gradibus in anglia non apparebit¹³⁷

Constabularius could, perhaps, have had contact with Jewish scholars without leaving the country. Peter Alfonsi was a Christian convert, but until they were expelled by Edward I in 1290 there were many unconverted Jewish scholars in England. But the evidence for contacts between Jewish and Christian scholars is tantalisingly circumstantial.¹³⁸

Less than twenty years before Constabularius wrote his treatise London received a distinguished visitor: "Rabbi Abraham ibn Ezra, the globe-trotting philosopher, poet, grammarian and exegete".¹³⁹ According to Raphael Levy, ibn Ezra was unusual amongst medieval Jewish scholars for his neo-Platonism, and remarkable for his critical attitude to Scripture - he doubted Moses's authorship of the Pentateuch.¹⁴⁰ More entertainingly, M. Friedlander records the story that "he died in England, surrounded by shedim in

¹³⁷Cot.Vit.A.XII fol.96ra.

¹³⁸Raphael Loewe, "The Mediaeval Christian Hebraists of England", Transactions of the Jewish Historical Society of England 17 (1953), 224: "There is as yet nothing explicit to attest a pupil-teacher relationship or collaboration on the part of any known English Christian and any known Jew in mediaeval times".

¹³⁹C.Roth, The Jews of Medieval Oxford (Oxford Historical Society 1951), p.119.

¹⁴⁰Raphael Levey, The Astrological Works of Abraham ibn Ezra (Baltimore 1927), p.10.

the form of black dogs".¹⁴¹ It is particularly interesting that ibn Ezra had calendar interests: while he was in England he wrote a Letter of Sabbath, three essays on the beginning of the year, the month and the day.¹⁴²

Is it possible that Constabularius could have had contact with a Jewish scholar of this type? His treatise is particularly detailed on the subject of Jewish observances, but his information on this score could equally well have been found in the Old Testament.

More relevant are references to Jewish calendar practices,¹⁴³ although these could have been gleaned from written rather than oral sources. One Jewish authority is cited by name. Rabbi Samuel, we are told (if this is how the text, which is difficult to decipher here, is to be interpreted) "ascended the professorial chair soon after the Destruction of the Temple" (i.e., A.D.70), and was renowned for his knowledge of astronomy.¹⁴⁴ We are later told that he was the most skilful of all the Jewish

¹⁴¹M.Friedlander, "Ibn Ezra in England", Transactions of the Jewish Historical Society 2 (1894-5), 59.

¹⁴²"Ibn Ezra in England", 52. The beginning of the year and of the day are constant preoccupations in the "schools compoti".

¹⁴³BL MS Cot.Vit.A.XII fol. 90rb (on the discrepancy between the Jewish and Ecclesiastical date of the new moon); 94rb (the Jewish annus presens); 97ra (on the observance of the Passover).

¹⁴⁴BL MS Cot.Vit.A.XII fol.95ra: Hic samuel cathedram magistralem ascendit quartus abekina qui fuit presens cito destruyente templum.

masters.¹⁴⁵ Who was Rabbi Samuel? The most likely candidate seems to be Samuel Yarhina'ah (Mar Samuel, c.165-257) who was a Jew of the Dispersion who lived in Babylon. He "devoted himself especially to that branch of applied astronomy that deals with calendric science".¹⁴⁶

Rabbi Samuel, as the following table shows, is but one among many of the authorities whom Constabularius cites. The use to which he put his extraordinarily wide range of reference will be studied in some detail later.¹⁴⁷ It is impressive evidence of what was available to one English scholar, possibly in the West of the country, at the end of the twelfth century. And it is this type of computistical tradition, and this breadth of learning, I would argue, that lies behind the deceptively simple treatise which is the subject of this edition, and to the description of which I shall now turn.

¹⁴⁵BL MS Cot.Vit.A.XII fol.96vb: iudeorum probatissimus magister fuit.

¹⁴⁶Jewish Encyclopaedia XI (New York/London 1905), 31. Anyone who undertook the editing of Constabularius's treatise would, of course, have to examine his links with Rabbi Samuel in detail.

¹⁴⁷See pp.331ff.

Appendix to Chapter II: the citations in the Compotus of

87rb; 93va; 96ra. Constabularius.

Abrachiz: 90vb; 91va; 93va; 93vb; 94ra; 94va; 94vb; 95rb;

95rb; 95va; 96ra; 96vb; 97ra.

Actimon:

96ra.

Agathobolus:

95ra.

Alfraganus:

96ra.

Anatholius:

89rb; 92rb; 93vb; 95ra; 95vb.

Aristobolus:

95ra.

Arzachel:

95va; 96ra.

Bede:

89va; 90ra; 90rb; 90va; 90vb; 91vb; 93rb; 93vb; 94ra; 94va;

95ra; 96rb; 96va; 97ra; 97rb; 97va.

Cyril: 97ra; 97rb.

95ra; 95vb.

Dionysius:

89va; 89vb; 90ra; 91rb; 91vb; 93ra; 94ra; 94va; 96rb; 96va;

97ra.

Eusebius:

93vb; 95rb; 96va.

Felix:

87rb; 95va; 96ra.

Gerland:

87ra; 90va; 90vb; 91va; 93va; 93vb; 94ra; 94rb; 94vb; 96rb;
96va; 97ra; 97va.

Helperic:

90vb; 94ra.

Hipparchus:

94vb; 95vb.

Hippocrates:

94vb.

Isidore:

89rb; 91ra; 91vb; 96va.

Josephus:

95ra.

Justinian:

93vb.

Macrobius:

88vb.

Marianus Scotus:

96va; 97ra; 97va.

Martianus Capella:

94vb; 95vb.

Mitan:

96ra.

Pachomius:

91vb.

Philonideus:

95ra.

Pliny:

94vb; 95vb.

Procerius:

95ra.

Prosper:

96va.

Ptolemy:

89va; 95rb; 95va; 96ra; 96vb; 97ra.

Samuel:

91vb; 95ra; 95va; 96vb.

Silvester:

88ra.

Solinus:

93rb; 93va; 94rb.

Solon:

96va.

Thebit:

95rb; 95vb.

Theophilus:

90rb; 91vb; 93rb; 94vb; 95ra; 96rb; 96va; 97ra.

Victor Capuanus:

95ra.

Victorinus:

96va; 97ra.

Victorius:

92rb.

Chapter III.

Compotus ecclesiasticus: title, date, authorship, provenance.

1. The Evidence.

Why Compotus ecclesiasticus? When, and by whom, was the treatise written? These are inter-related questions, and in attempting to answer them, I shall refer to various texts, some of which have received little attention. It seems sensible, therefore, to explain what these are first.

To begin with, there is the evidence contained in the treatise itself, copied at different places and at different times, and the codices in which it appears.¹ I shall refer also to the calendar treatises which were written, or have been said to have been written, by three thirteenth-century writers, Robert Grosseteste, John of Sacrobosco and Alexander de Villa Dei. In addition, some useful information is contained in the unprinted Commentum computi ecclesiastici of Master Conrad;² and in commentary material about writers on compotus which I have studied in three related MSS.³

¹see below, Chapter V.

²Vienna NB lat. MS 3816, fols.51b-109b.

³Cambridge MS Gonville and Caius 137, fols.92ff; Digby 191, fols.66v-70v; 193, fols. 27rb-va.

Compotus ecclesiasticus and Robert Grosseteste.

According to S.H.Thomson, Grosseteste wrote four works on the calendar, each revising the one that went before:

This compotus (Compotus I) should be compared with the Compotus correctorius, but it would appear that the present work antedates the Kalendarium, which in turn is corrected by the Compotus correctorius, and that some years later (1244), Grosseteste found it necessary to bring his calculations up to date.⁴

In fact, only the Compotus correctorius⁵ can be positively identified as Grosseteste's. Its authenticity, obvious enough from its style and content, is supported by Roger Bacon, who quotes from it in his own Compotus, citing Grosseteste by name.⁶ Bibliographical tradition, too, would point to this work. The Dominican, Nicholas Trivet, recorded that Grosseteste wrote one work on Compotus.⁷ The earliest extant catalogue of Grosseteste's writings,

⁴S.H.Thomson, The Writings of Robert Grosseteste (Cambridge, Mass., 1940), pp.94-5

⁵Robert Grosseteste, Compotus correctorius, in Opera hactenus inedita fratris Rogeri 6 (Oxford 1926), ed. R.R.Steele, 212-267.

⁶ Compotus, ed. R.R.Steele, Opera hactenus inedita fratris Rogeri 6 (Oxford 1926), 40: "Lincolniensis autem episcopus aliter distinguit". The passage to which Bacon is referring is to be found on p.219 of the same volume.

⁷F.Nicholai Triveti Annales, ed. Thomas Hog, (London 1845), p.243: Tractatus etiam de sphaera et de arte compoti, multaque alia in philosophia utilia, edidit.

preserved by Thomas Tanner, also lists only one work: De computo.⁸ Bale listed three works, but only one has an incipit which is recognisably Grosseteste's. This is Compotus est numerationis, which is the beginning of the Compotus correctorius.⁹ Steele printed the Compotus correctorius in his edition of Roger Bacon's Compotus, but it has received little critical attention. Its relationship to the Compotus ecclesiasticus will be discussed in this chapter.

Of the other calendar works assigned to Grosseteste by Thomson, only the Kalendarium has been printed.¹⁰ Thomson's contention that it is referred to in the Compotus correctorius and the Compotus minor is untrue. The references are not to an original work by Grosseteste, but to the Church Calendar. The Kalendarium is a ciclus lunaris of a traditional kind. It is innovatory in that it covers a 76- rather than a 19-year period (which allows for a more accurate correlation of solar and lunar movements), and in that it gives the hour of the new moon as well as the day on which it can be expected. More importantly, it proposes that the Nineteen-year Cycle should be emended by the

⁸Thomas Tanner, Bibliotheca Britannico-Hibernica (London 1748), p.xxxvii.

⁹ John Bale, Scriptorum illustrium maioris Brytanniae (Basle 1557), p.306.

¹⁰Ed.Arvid Lindhagen, "Die Neumondtafel des Lincolniensis", Arkiv för Matematik, Astronomi och Fysik 11/2 (1916), 15-41.

shifting of the golden number.¹¹ Possibly Grosseteste was responsible for the preface which accompanies it in the ascribed texts, and it is interesting that according to its writer, the astronomical data in the tables is consonant with the meridian of Paris.¹² But the calendar itself appears, in almost identical form, in the earlier Compotus of Roger of Hereford;¹³ and references in Roger's text make it clear that it is integral to this work. Of course, this does raise interesting questions about the possibility of Grosseteste knowing Roger's work. On the evidence of surviving MSS, Roger's Compotus does not appear to have had a very wide circulation.¹⁴ Grosseteste, however, had connections with Hereford, and spent some important years of his life there.¹⁵ It is reasonable to conjecture that he became acquainted there with the ideas that preoccupied Roger and his circle.

The other works which have been attributed to Robert Grosseteste, Compotus I and Compotus minor, are both versions of the Compotus ecclesiasticus which is the

¹¹See below, pp.365ff.

¹²"Die Neumondtafel des Lincolniensis", p.15: Et notandum, quod tam dies quam horae primationis lunae in 4 cyclis hujus kalendarii sunt secundum mediam conjunctionem luminarium super meridianum Parisius ut credo. I am grateful to Dr Raymond Mercier for drawing my attention to this point.

¹³ Bodl.Ms Digby 40 fols.38r-43v.

¹⁴But see below, p.84-85.

¹⁵See R.W.S.Southern, Robert Grosseteste: the Growth of an English Mind in Medieval Europe (Oxford 1986), pp.65-69.

subject of this edition. Some interesting features of the abbreviated text to which Thomson gave the title Compotus minor are discussed below. It has recently been argued that Thomson was correct in assigning Compotus I to Grosseteste.¹⁶ I shall set out my objections to this thesis in some detail.

Compotus ecclesiasticus and John of Sacrobosco.

Another question which will be discussed is the relationship between the Compotus ecclesiasticus and the De anni ratione of John of Sacrobosco. Similarities between the texts have sometimes confused cataloguers. Sacrobosco wrote two other very popular works, on the Algorism and on the Sphere.¹⁷ Contemporary and near-contemporary documents often list together Algorism, Sphere and Compotus. Furthermore, treatises on these topics often appear together in MSS, and it is not surprising that the last of the trio has generally been assumed to be the De anni ratione. In many cases it is, but I have come across four

¹⁶ R.C.Dales, "The computistical works ascribed to Robert Grosseteste", Isis 80 (1989), 74-79.

¹⁷ John of Sacrobosco, Algorismus ed. J.O.Halliwel-Phillips, Rara arithmetica (London 1839); De spera, ed. Lynn Thorndike, The Sphere of Sacrobosco and its Commentators (Chicago 1949). There is no modern edition of the De anni ratione, and for this reason it has been reproduced here as an appendix, from Philip Melancthon's 1538 edition.

MSS in which the calendar work is the Compotus ecclesiasticus.¹⁸

Who was John of Sacrobosco? Despite the popularity of his writings even into the seventeenth century, very little is known about the man, and what has been recorded is often erroneous. In particular, the translation of what is probably a toponymic surname as Hollywood, and the identification, first made by Leland, of that placename with Halifax in Yorkshire, has led to some unwarrantable speculation about his origins.¹⁹ Olaf Pedersen has recently attempted to set the record straight.²⁰ I can add nothing to his admirable discussion of the evidence, except to suggest that the antiquarian Richard Stanihurst (1547-1618) was responsible for Sacrobosco's supposed Irish connection. There are three Hollywoods in Ireland, in Co.Down, Co.Wicklow and Co.Dublin, although the name appears always to have been latinised as Sanctus Boscus. Stanihurst seems to have connected the last of these with Sacrobosco. The suggestion is not to be found in his own Description of

¹⁸ BL MS Add.27589; Oxford MS C.C.C.293B; Bodl.MS 679; Oxford MS Univ.26. In Bodl.679 the Algorism has the incipit Cum hec scientia que algorismus, but it appears to be an abbreviated version of Sacrobosco's treatise.

¹⁹ At its most fantastic in the work of the West Riding antiquarian Ralph Thoresby: see Ducatus Leodiensis (London 1715), p.194 for a reference to "the Hill at Hallifax ... upon which the famous Johannes de Sacrobosco lay on his back to observe the motion of the stars, when he writ his celebrated book de Sphaera ... "

²⁰ Olaf Pedersen, "In quest of Sacrobosco", Journal for the History of Astronomy 16 (1985), 175-221.

Ireland (1577), but it is recorded some fifty years later by Meredith Hamner: "Stanihurst writeth he [Sacrobosco] was borne at Fingall in the city of Dublin."²¹ Stanihurst presumably knew his fellow-Catholic, Christopher Hollywood, who led the Jesuit mission to Ireland between 1604 and 1626, and who had family connections with North Co. Dublin. Christopher Hollywood latinised his name as a Sacrobosco, which was perhaps a claim that the Computist was his ancestor. It was a claim still worth making at this period.

Grosseteste and Sacrobosco both wrote computistical works, and both wrote treatises on the Sphere. Modern commentators have sometimes been puzzled by apparent parallels in the works of the two writers. An investigation into the relationship between the Computus ecclesiasticus and the De anni ratione will throw some light on the way Sacrobosco worked, and may suggest a line of enquiry with regard to the two works on the Sphere.

Computus ecclesiasticus and Alexander de Villa Dei.²²

By the fourteenth century, Algorism, Sphere and Computus had become "core subjects" in the Quadrivium at Oxford. Sacrobosco wrote treatises on all three topics. Grosseteste seems to have written nothing on Algorism, but the third

²¹ Meredith Hamner, The Historie of Ireland II (Dublin 1633), 200.

²²For Alexander, see above, pp.34ff.

member of our trio, Alexander de Villa Dei, while apparently being silent on the Sphere, wrote both on Algorism and Compotus.

The Carmen de algorismo often appears in MSS with the Algorismus of John of Sacrobosco, and the Massa compoti with the De anni ratione or the Compotus ecclesiasticus. Alexander's works must have been very useful for students with limited access to written material but an enviable capacity to learn by heart. But such students would still need prose texts, to expand and clarify what they had learned from Alexander, and it is for this reason, no doubt, that these works are found together.

Similarities between the Carmen de algorismo and the Algorismus led Guy Beaujouan to state that Sacrobosco's arithmetical treatise was "manifestly inspired" by Alexander's.²³ Verses from the Carmen appear in the Algorismus. Verses from the Massa compoti appear in the De anni ratione, and also in the Compotus ecclesiasticus.²⁴

Compotus ecclesiasticus and the commentators.

²³Guy Beaujouan, "L'enseignement de l'arithmétique élémentaire à l'Université de Paris aux xiii et xiv siècles, Homenage a Millas-Vallicrosa I (Barcelona 1954), 107.

²⁴Parallel text in the Massa compoti and the Compotus ecclesiasticus is detailed in the Commentary.

In view of the similarities between the Algorithms of Alexander de Villa Dei and John of Sacrobosco, it is not surprising to find Sacrobosco's treatise, on at least one occasion, catalogued as a commentary on the Carmen de algorismo.²⁵ It would have been pleasant for the medieval student if all the commentaries he was forced to study had been as accessible as Sacrobosco's work. More often, as Beaujouan tells us, they would have been faced with a standardised exposition of the Four Causes (material, formal, final and efficient) which reduced the contribution of the lecturer to the minimum.²⁶ A particularly tiresome example of the species is the Commentum computi ecclesiastici of Master Conrad. The commentary dates from 1396,²⁷ and is not to be confused with the thirteenth century Computus of Conrad of Strasbourg.²⁸ It was examined in some detail by Ferdinand Kaltenbrunner. He mistakenly assumed that Master Conrad was the author of the Computus ecclesiasticus, rather than a commentator on that text, and claimed that he was the "first forerunner of the Gregorian calendar reform".²⁹ Among the mass of material contained in

²⁵ Dublin, Trinity MS 441, fols.99v-104: "Comm. on Alexander de Villa Dei, Algorismus (another copy BL Royal 12.F.XIX)."

²⁶Guy Beaujouan, "L'enseignement de l'arithmétique élémentaire", 105.

²⁷ Vienna BN lat. 3816 fol.97b: sed modo tempore nostro, scilicet anno domini millesimo trecentesimo nonagesimo sexto

²⁸ See above, pp.35-37.

²⁹ Ferdinand Kaltenbrunner, Vorgeschichte der Gregorianische Kalenderreform (Vienna 1876), p.293.

the Commentary there is some useful incidental information about our present treatise.

It was not the function of this kind of commentary to be innovative. M. Conrad had at his disposal a body of information which he could call upon as necessary. Material of this kind is to be found in a fourteenth-century MS, Cambridge Gonville and Caius 137, and in two related MSS of the same period, Oxford, Bodl. Digby 191, Digby 193. M. R. James called the first text "an account of writers on computus". Because the computistical tradition described in the MSS is manifestly that to which the Computus ecclesiasticus belongs, and because the texts contain references to Grosseteste, Sacrobosco and Alexander de Villa Dei, I shall describe them in some detail.

The account in MS Gonville and Caius 137 deals first with the early history of the computus, naming Romulus, Numa Pompilius and Julius Caesar as the prima causa efficiens, the first authors of the subject. Much of the same detail is to be found in the Computus ecclesiasticus. There follows a passage which is worth quoting in full:

multi alii videlicet Dionisius quidam abbas romanorum qui de ista scientia tractavit et quasdam tabulas invenit, que tabule Dionisii appellatur. Sic Beda universitatis Parisiensis ut quidam dicunt institutor tabulas de iste scientia composuit que tabule

dicuntur. Postea Alfricus [Helpericus] quidam abbas Anglorum istam scientiam in multis commendavit et in ipsa studuit. Deinde Gerlandus in confinie Anglie et Germanie oriundus in ista studuit et ipsarum in pluribus dilatavit. Deinde episcopus Lincolnensis in ipsa scientia studuit et quoddam compotum subtilissimum edidit. Deinde vero in nostro tempore quidam Johannes nomine Anglicus de Sacrobosco dictus satis [in hiis³⁰] exercitatus et scripta omnium precedentium in pluribus emendatus et compilationem novam secundum ordinem debitum ad utilitatem enim illam audiencium edidit. Et quia omnes predicti processerunt pro laici et difficili quia modo physico quidam magister Alexander de Villa Dei modo ecclesiastico et metrice compotem utilem et brevem ad utilitatem omnium illum edidit audiencium. Ex istis patet quod sic causa efficiens istius libri quoniam magister Alexander de Villa Dei³¹

Much of the same material appears in the two Digby MSS. In Digby 191, it is catalogued as Introductio, ut videtur, in commentarium super quodam tractatu (forsan Rob. Grosseteste) de computo kalendarii. It begins with a familiar statement about the "four necessities" of the Church,³² which is followed by the material to be found in

³⁰Text indecipherable: emended from Digby 193.

³¹Cambridge MS Gonville and Caius 137 fol.92v

³²See above, p.30.

MS Gonville and Caius 137, adapted for use in a commentary on the Computus correctorius of Robert Grosseteste, the incipit of which is quoted:

Est autem computus scientia numerationis et divisionis temporum etc.

Bede is described as being venerabilis presbyter natione Anglicus; Gerland, on the other hand, is connected not with England, but with France. The script is difficult to read. A passage on the "many" whom the writer has omitted is luckily duplicated in Digby 193. The text continues:

Deinde Johannes de Sacrobosco novam compilationem compoti nobis presentavit. Et deinde Lyncolniensis episcopus philosophice eadem demonstravit.

Alexander de Villa Dei is not mentioned, and neither Alexander nor Grosseteste feature in the third MS, Digby 193. It begins:

Computus est scientia. Cum inter seculi sapientes antiquitus

After detailing the history of the computus from Romulus to Bede it continues:

Postremo autem omnium Garlandus in confinie Gallie et

Germanie oriundus viros prenotatos erroris et prolixitatis audacter redarguit, set scientiam in non observandis et planetarum causarum assignationibus confudit; quam plures etiam aliorum quorum nunc nomina memorare causa compendii pretermitto, scientiam istam complere conati sunt.

set in superfluis habundantes et necessariis deficientes, a complemento huius scientie semper deciderunt.³³

But now, we are told, a certain modern writer, highly skilled in these matters, has thrown light on all the errors of this science, and has edited a new compilation; and this new edition by Master John of Sacrobosco the commentator has at hand :

sicut igitur quidam modernorum satis in hiis exercitatus omnes huius scientie errores illuminans novam edidit compilationem editam a magistro Johanne de Sacrobosco quam pre manibus haberemus.

The causa materialis, the subject-matter of the treatise, is described, and the "three parts" of philosophy detailed, but the writer does not enlarge on the causa finalis, for he thinks it is superfluous to explain the usefulness of this science:

³³Oxford Bodl. MS Digby 193 fol 27rb.

utilitatem huius scientie superfluum existimo annotare cum nec a pluribus nec in locis pluribus ignis vel aque beneficium quam temporis discretio exigatur.³⁴

The same statement, in almost the same words, is to be found in the Compotus of Roger of Hereford, suggesting either that the commentator is referring to this treatise, or that both passages have a common source.³⁵

There follows a rather puzzling passage which leads into what is manifestly the incipit of the De anni ratione:

Titulus autem licet contemporaneos [..us?] auctori propter invidorum detractionem latere consueverat, set J. de Sacrobosco nova compoti compilatio incipit Compotus etc. ex motibus solis.³⁶

What, then, are we to make of the material preceding this incipit? I would suggest that it relates to the Compotus ecclesiasticus, which is identified by the shorter incipit Compotus est scientia at the beginning of the text, and which is untitled, "because of the slander of the envious".

2. The Title.

³⁴Oxford Bodl.MS Digby 193 fol. 27va.

³⁵Cf. MS Digby 40 fol.22v: Utilitatem vero huius scientie superfluum videtur annotare, cum nec a pluribus nec in locis pluribus ignis vel aque beneficium plusquam temporis noticia exigatur.

³⁶I am grateful to a member of Bodley's staff who helped me decipher this passage.

In all the codices I have examined, with the exception of MS Bodl.679, the treatise is untitled. Bodl.679 begins Hic incipit computus Roberti Grosseteste. S.H.Thomson called the abbreviated version of the treatise in Dublin, Trin.441 Computus minor, but this title is to be found nowhere in the text. The phrase is to be found in the ninth century Visitation Articles of Regino of Prüm: the cleric is to be asked:

si computum minorem, id est epactas, concurrentes regulares, terminos paschales, et reliquos sapiat.³⁷

I have chosen to call the treatise edited here Computus ecclesiasticus, since it follows Church usage, as Alexander de Villa Dei describes it.³⁸ Computus ecclesiasticus was an expression which was applied generally to the study of the calendar as used by the Church; but there is some evidence that the treatise which is the subject of this edition may have been known specifically by this title. The Commentary of Master Conrad contains a great deal of garbled information. The writer appears to regard the Massa compoti and the Computus ecclesiasticus as one work, for which he gives two different titles:

Tytulus libri duplex est unomodo sic intytulatur

³⁷Regino of Prüm, De synodalibus causis vel de disciplinis ecclesiasticis, PL 132, 191.

³⁸See above, p.34.

Incipit massa computi et dicitur massa propter similitudinem lammis alicuius metelli; una massa conficiatur sic ex multis libris de arte computi tractantibus. Auctor iste istum librum compilavit alio modo sic intytulatur Incipit computus ecclesiasticus³⁹

On the previous folio he has identified the Compotus ecclesiasticus by its incipit. Possibly, however, the work was generally untitled, as the statement quoted above from MS Digby 193 suggests.

3. The Date.

It is often assumed that computi may be safely dated from information provided by the texts themselves, either by a reference to the annus presens, or by a calculation which would allow the annus presens to be deduced. There are some difficulties with this: the annus presens or the calculation may be a fossil from an earlier source; or the original date or calculation may have been altered by a later copyist.⁴⁰ Nevertheless, since all the MSS containing the treatise that I have been able to examine contain the following statement:

³⁹ Vienna NB Lat. 3816, fol.53ra

⁴⁰Ludwig Traube, "Computus Helperici", Neues Archiv 18 (1893), 73-105, repr. Vorlesungen und Abhandlung, ed. S.Brandt (Munich 1920) III, 137, records 19 different dates for the annus presens in MSS of Helpericus's Treatise.

Set a nativitate Domini elapsi sunt 1200 et eo
amplius⁴¹

it would seem reasonable to suppose that the work was composed at some point after 1200, particularly since the discussion of the over-estimation of the length of the tropical year depends on this date.

The treatise could not, at any rate, have been written earlier than 1160-1164. All the texts which I have examined contain the following statement:

Si autem velis quare in vigiliis aliorum apostolorum non ieiunamus, in Summa magistri Johannis Beleth plenius invenitur.⁴²

The Summa de ecclesiasticis officiis of John Beleth can be reliably dated to a period between the years mentioned, since it refers to Maurice of Sully who became Bishop of Paris in 1160, and also to a "certain very religious woman called Elisabeth who is still alive and living in Saxony." Elisabeth of Schonau died in 1164.⁴³

But how much later than 1200 does et eo amplius imply?

⁴¹Compotus ecclesiasticus p.231.

⁴²p.233.

⁴³John Beleth, Summa de ecclesiasticis officiis ed. H.Douteil (CC Cont.Med.41, Turnholt 1976) 30*-31*.

S.H.Thomson dated the text he called Compotus minor to 1244, on the evidence of a marginal addition, scilicet 44.⁴⁴ Sir Richard Southern has shown this to be a mistaken assumption.⁴⁵ Interestingly, there is a similar marginal addition in an earlier MS, BL Add.27589. I shall argue below that these notes refer to the De anni ratione of John of Sacrobosco, and that the latter is a close adaptation of the Compotus ecclesiasticus. If this is the case, then our treatise must date from before the composition of the De anni ratione, i.e., from before 1235.⁴⁶

I shall argue further that the Compotus correctorius of Robert Grosseteste was influenced, although to a lesser extent, by the Compotus ecclesiasticus. The former work has been dated to c.1225 by both Southern and McEvoy.⁴⁷

On these grounds, I suggest that the Compotus ecclesiasticus can be dated to the first quarter of the 13th century.

⁴⁴S.H.Thomson, The Writings of Robert Grosseteste, p.97.

⁴⁵R.W.Southern, Robert Grosseteste, Scholar and Bishop (Oxford 1986), pp.127-128.

⁴⁶For the date of the De anni ratione see Lynn Thorndike, The Sphere of Sacrobosco, p.8; Olaf Pedersen, "In quest of Sacrobosco", Journal for the History of Astronomy 16 (1985), 189.

⁴⁷ See R.W.Southern, Robert Grosseteste, p.139; James McEvoy, "The chronology of Robert Grosseteste's writings on nature and nature philosophy", Speculum 58 (1983), 618.

4. Authorship.

I have been unable positively to identify the author of the Compotus ecclesiasticus.

Two MSS - Bodl.679 and Dublin, Trin.441 - carry ascriptions to Grosseteste, and because of this, have been the subject of some critical attention. The treatise in Bodl.679 is ascribed in the explicit to "Master Robert Grosseteste". This ascription is in the hand of the copyist; but a later hand, that of Clement of Canterbury,⁴⁸ has written Hic incipit compotus magistri Roberti Grosseteste, and added the heading Compotus R.G. across the verso and recto of fols.65v-70r. The text in Trin.441 is not itself ascribed, but a list of contents in a contemporary or slightly later hand on fol.1 of the codex contains the following items:

Compotus domini roberti lincoln

De arte algorismi in communi

Item alius tractatus eiusdem magis in speciali

The three works (or possibly the first and third) are linked by a bracket to the word Lincoln.

Compotus I and Compotus minor.

⁴⁸See B.C.Barker-Benfield, "Clement Canterbury's commonplace book", The Pelican (1978-9), 3-20.

The ascriptions in these two MSS were first noted by S.H.Thomson, who was convinced of their authenticity. He assumed that he was dealing with two separate works.⁴⁹ Grosseteste's authorship of Compotus I was "assured by its early (xiii¹) ascription"; it was similarly "clearly indicated" in the case of Compotus minor.⁵⁰

Although Thorndike and Kibre questioned the ascription in Bodl.679 (though not, interestingly, that in Trin.441),⁵¹ both versions of the treatise were accepted as the work of Robert Grosseteste by later commentators, including McEvoy and Southern. The latter, however, noticed that the two apparently separate works were closely related. He suggested that Compotus minor was a recension of Compotus I.

Professor Richard Dales, while accepting that Compotus minor is not an independent text, says that "There ... seems to be no good reason to doubt Grosseteste's authorship of the Compotus I". He was unaware that there were other copies of the Compotus ecclesiasticus, and describes Bodl.679 as dating "from the second quarter of the thirteenth century": thus, he says, the ascriptions in

⁴⁹In the following discussion, Compotus I will denote the treatise as it appears in Bodl.679; Compotus minor the abbreviated version to be found in Trin.441.

⁵⁰S.H.Thomson, The Writings, pp.94-5; 97.

⁵¹Thorndike and Kibre 888.

this MS "certainly predate 1250".⁵²

It is worth considering the nature of the ascriptions in both MSS. In Bodl.679, it is certainly positive enough. What is less clear is that it pre-dates 1250. Madan was of the opinion that the codex was of a much later date: "I should have said emphatically xiv".⁵³ If the codex does indeed date from the fourteenth century, the fact that Compotus I is ascribed to "Master Robert Grosseteste" rather than to Lincolniensis becomes an oddity, rather than evidence that the codex was written while Grosseteste was still "an unbeneficed provincial master".

In Trin.441, as has been indicated above, the attribution to Lincolniensis appears only in the list of contents. Of the three works here bracketed together, the first is indubitably the Compotus correctorius of Robert Grosseteste. But the second item, although unascribed, is the Algorismus of John of Sacrobosco.⁵⁴ It is difficult to see what the compiler of the contents intended. Did he think that the Compotus ecclesiasticus was the work of

⁵²R.C.Dales, "The computistical works ascribed to Robert Grosseteste", Isis, 80 (1989), 76.

⁵³Note in Duke Humfrey card index. A member of Bodley's staff kindly identified Madan's handwriting.

⁵⁴M.L.Colker identifies it as a Commentary on the Algorismus of Alexander de Villa Dei, but there is no mention of Alexander in the text, which is substantially the same as the text of the Sacrobosco treatise as printed by Halliwell.

Sacrobosco, the eiusdem magistri referring to the writer of the Algorism, rather than to Robert Grosseteste? He might have had good reason for doing this.⁵⁵ Probably the attribution to Grosseteste was intended; and it is interesting that the only two codices which contain the Grosseteste attribution might at one stage have been in the same place. Bodl.679 was once in the possession of St Augustine's Abbey, Canterbury.⁵⁶ There is no positive evidence that Trin.441 belonged to the Abbey, but it did belong to John Dee, and he got many books from St Augustine's, via John Twyne.⁵⁷ It would not be surprising if similar texts, if they were known to the same readers, had similar inscriptions.

Did Robert Grosseteste write the Compotus ecclesiasticus?

It is a well-known fact, as Dales reminds us, that "famous names tend to attract the attribution of spurious works", and this is certainly true of Robert Grosseteste. There is an interesting statement in the Commentary of Master Conrad which could be evidence that the Compotus ecclesiasticus had been attributed to the great bishop:

⁵⁵See below, pp.107ff.

⁵⁶See p.174.

⁵⁷A.G.Watson, "John Twyne of Canterbury (d. 1581) as a collector of medieval MSS", The Library, 6th ser.8 (1986),136. One of the books that Dee had was the Library's 15th century catalogue (now Dublin, Trinity MS 360). He appears to have used it as a shopping list, marking the books that interested him with unpleasant blue pencil.

Causa efficiens creditur fuisse Robert Crisostius,
quod tamen ignoranter⁵⁸

But we note that Conrad himself dismisses the claim. His conclusion is that the author of the Compotus ecclesiasticus is unknown. He continues:

secundum Senecam non est curandum quis dicat set quid
dicatur

It must be emphasised that the treatise which Dales thought existed in a single MS appears in many other codices too; and that, without exception, these are not ascribed to Robert Grosseteste; nor, indeed, to anybody else. But Dales argues for Grosseteste's authorship of Compotus I not only because of its ascription, but on grounds of style and content as well. This dissertation is not primarily concerned with Grosseteste's computistical activities, and this is not the place for a detailed examination of his writings in the light of Dales's contention. I propose here to deal only with the specific points which Dales makes in support of his argument.

To consider content first. It is customary in Grosseteste's early work to look for evidence of his use of the new learning which was gradually becoming accessible to the Christian West. Dales notes that there is "no trace of

⁵⁸Vienna 3816 fol.52vb

Arabic astronomy" in the treatise,⁵⁹ but remarks on "an Aristotelian dictum based on Physics 2.195a"

Nam posita causa efficiente et immediate, et ponitur eius effectus⁶⁰

Examination of other copies of the Compotus ecclesiasticus show that this statement is not integral to the text.

Dales finds certain "distinctive characteristics" in Compotus I that "hint at" Grosseteste's authorship. The first is a concern with the "errors in the calendar and in the computistic tradition that have resulted in the feast days coming earlier than they should". This concern about the dates of the equinoxes and solstices is not a new one - it can be traced back to Bede's De temporum ratione - and, as will be shown later, the proposed solution to the problem, although innovatory, does not occur uniquely in this text. As has been shown already, there are good reasons for dating the Compotus ecclesiasticus to the beginning of the thirteenth century. If Grosseteste had written it, it would have been while he was "an unbeneficed provincial master". Southern tells us that "In his younger poorer days, Grosseteste concentrated his attention on problems to which he could make an original contribution of

⁵⁹I would dispute this: see p.282-284.

⁶⁰ Bodl.679, fol.65r.

his own".⁶¹ In the Compotus correctorius, he did propose a solution to the problem, and one that met with general approbation; but there is no evidence in the Compotus ecclesiasticus of the sort of innovatory material which we might have supposed would have engaged the attention of the young Grosseteste.

Again, Dales draws our attention to a statement which occurs, in Compotus I, in the following form:

Set notandum quod cum hec subtractio ab autoribus sit autentica, tamen habet in se multiplicem questionis scrupulum et falsitatis admixtionem questionis que alias pro loco et tempore verificatur.⁶²

He comments: "Thus the author explicitly promised a subsequent work that would correct the vexed problems of the tradition".

It should be noticed that the phrase containing the promise

que alias pro loco et tempore verificatur

is not present in all copies of the text. But even if it were integral to the work, can it be assumed to be Grosseteste's comment, made, Dales tells us, "in some

⁶¹R.W.Southern, Robert Grosseteste p.47.

⁶²p.263.

exasperation"? The comment, whoever wrote it, refers specifically to the saltus lune, which has been defined earlier in the text as

subtractio unius diei a lunatione iulii in ultimo anno
cicli decennovenalis⁶³

rather than to all the vexed problems of the tradition.

Dales argues for Grosseteste's authorship of Computus I on the grounds of style as well as content. He directs us to a passage which he says is "typically Grossetestian in its length, complexity and coherence":

Sed quia difficile esset istas sex horas cuilibet anno
continuaré ita quod numquam redacte in diem alicubi
poneretur, quia secundum hoc, si annus precedens
incipit a mane, secundus a meridie, tertius a vespere,
quartus a media nocte, et sic feria sanctorum
variantur, et ita principium Ianuarii posset ascendere
quod esset circa equinoctium vernale et ulterius, ita
quod principium anni esset in tam longis diebus sicut
sit dies solsticii estivalis, ideo provisum est ut sex
hore excrescentes in primo anno et sex in secundo et
sex in tercio transferantur ad sex horas quarti anni,
et erunt in quarto anno .xxiiii. hore, id est unus
dies sic particulariter collectus, et interponitur

⁶³p.261.

Februario, quia mensium brevissimus est.⁶⁴

This is not the place for a detailed examination of Grosseteste's style, which would no doubt be found to vary according to time, place and circumstance; but Dales refers us to his own discussion of this matter in his introduction to the De cessatione legalium. Here he tells us that "Grosseteste often employs long, involved periods of a page or more, interrupted by a parenthetical expression, but always returning, grammatically and in thought, to the beginning".⁶⁵ Such a style would scarcely be appropriate to an elementary treatise, and it is emphatically not that employed by the writer of the Computus ecclesiasticus. If the passage is to be regarded as one sentence, it has to be punctuated in an eccentric manner which is not justified by any of the MSS (including Bodl.679) I have examined.

There are more serious reasons, in fact, for doubting that Grosseteste could have written this passage. It is muddled, and since it is substantially the same in all the MSS, it is probably fair to assume that the muddle is the author's. The passage appears to be based on Cap.xxxviii of the De

⁶⁴Dales, "The computistical works", p.76. feria in the sixth line is a misreading for festa. Cf pp.225-226 of this edition.

⁶⁵Robert Grosseteste, De cessatione legalium (Auctores Britannici Medii Aevi, O.U.P.1986), ed. R.C.Dales and E.B.King, p.xxix.

temporum ratione of Bede;⁶⁶

but the writer, in concentrating Bede's argument, has confused two separate items of it. The first explains how the bissextile is calculated; the second how the omission of the bissextile would alter the position of 1 January in relation to the equinox and solstice. The result is a statement that if the calendar consists of 4 years of 365½ days each, rather than of 3 years of 365 days followed by one of 366, it will affect the position of 1 January in relation to fixed points in the tropical year. Of course, this is not true, or true only in so far as there would be a self-rectifying adjustment without long-term effects.

responsible for the calculation, and that the error

A further problem that went unnoticed by Dales is an error which it is difficult to imagine Grosseteste perpetrating. Omission of the bissextile would result in an underestimation of the length of the solar year, and as a consequence of this, 1 January would "descend" towards the autumnal equinox, rather than, as this passage has it, "ascending" towards the vernal equinox. This is something which Grosseteste explains with admirable clarity, aided by a diagram, in the Compotus correctorius.⁶⁷

Of course, by the date at which the Compotus ecclesiasticus was written, it was clear that the error in the tropical

⁶⁶C.W.Jones, Beda's Opera de temporibus (Cambridge, Mass., 1943), pp.250-252.

⁶⁷Robert Grosseteste, Compotus correctorius, pp.214-215.

year was one of over, rather than underestimation:

recesserunt equinoctia et solstitia per hoc quod
attribuimus cursui solis plus temporis quam deberet
attribui⁶⁸

It would appear that the writer, with the later calculation
in mind, has confused the two.

Compotus ecclesiasticus and Compotus correctorius.

Dales has accepted my contention that Grosseteste was not
responsible for the Kalendarium, and that the Compotus
minor is not an independent work (the calculations in it
are of course precisely the same as those in Compotus I);
but he maintains the tradition of Grosseteste revising his
own work in respect of Compotus I and Compotus
correctorius, seeing a specific reference in the title of
the latter to the former. He tells us that the Compotus
correctorius is a "much more advanced work" than Compotus
I, but that it "retains many of the mnemonic verses and
some of the wording of the earlier work".

The title Compotus correctorius does indeed beg the
question: "more correct than what?" There are some
parallels between Compotus correctorius and Compotus
ecclesiasticus, and although, as I have argued, it is

⁶⁸ p.230.

unlikely that Grosseteste wrote the latter, this does not preclude the possibility that he might have seen it.

The most conclusive evidence that Grosseteste knew the Compotus ecclesiasticus at first hand is a mistake about Gerland's emendation of the Dionysian era which he appears to have repeated from the earlier text. This is a point which is more appropriately dealt with below.⁶⁹

There are other parallels. Grosseteste's work is not only "much more advanced" than Compotus ecclesiasticus: it is different in type, since it is a compotus philosophicus as defined by Alexander de Villa Dei, dealing with the exact divisions of time. To find parallels with Compotus ecclesiasticus, we have to look for passages which deal specifically with Church usage. Grosseteste's method is to give his own precise calculations, and then to append the more conventional treatment. It is the latter, he tells his students, which must be adhered to:

set quia sancta ecclesia solius bisextilis diei
interposicione adhuc contenta est, exposicione
kalendarii secundum usum ecclesie, Deo adjuvante,
prosequemur⁷⁰

⁶⁹See pp.304ff.

⁷⁰ Compotus correctorius pp.217-8

We are probably safe in assuming that Grosseteste knew the Compotus ecclesiasticus. How much use did he make of it? If we are looking for similarities between the two texts, we shall be struck first by the fact that, as Dales observes, many of the same mnemonic verses appear in both. Compotus ecclesiasticus contains 48 mnemonics (at least, in the form in which they are written); Compotus correctorius includes 19 of these (or 20, depending which MS is examined⁷¹). Additionally it has 6 (or 5, again depending on the MS) which do not appear in Compotus ecclesiasticus. Of course, Grosseteste could have found the 19 mnemonics in Compotus ecclesiasticus, but they are a computistical commonplace, and appear in many other places too. It is worth noting that they appear in Grosseteste's work in a different order, and sometimes in a different context. It is still possible that the idea of incorporating mnemonics into a prose text is one that Grosseteste found in Compotus ecclesiasticus. It was a handy way of sign-posting material, if we assume (as we surely must) that Grosseteste's students were familiar with Compotus as it was taught in the liberal arts course.

It has to be said that if the mnemonic verses are disregarded, verbal parallels between Compotus correctorius and Compotus ecclesiasticus are not obvious. Indeed, if we take into account the different functions of the two texts, it would be surprising if they were. Compotus

⁷¹See Compotus correctorius, p.230 n.

ecclesiasticus, it has been argued, is an elementary schools text. It employs a rhythmical and repetitive style, a useful learning aid, we may feel, for students whose access to written material might be limited. Typical of the author's method is the following passage on the concurrent and the solar regular:

Concurrentis est numerus septenarium non excedens, proveniens ex superhabundantia anni divisi per septimanas. Numerus dico large, ut unitas numerus appelletur.... Non excedens septenarium dico, quia concurrentis septem non transit.... Proveniens etc. dico, quia ille dies qui relinquitur ultra septimanas est causa concurrentis....

Regularis solaris est numerus septenarium non excedens, qui adiunctus concurrenti ferias mensium indicat. Numerus dico large, ut prius.... Non excedens septenarium, ut prius....⁷²

Grosseteste's definition of the same topics is far more succinct, as is appropriate to an advanced text:

Omnis autem numerus dierum sic excrescentium usque ad septenarium vocatur numerus concurrentis....

Attribuitur autem unicuique mensi numerus unus qui

⁷²pp.211, 213.

We can look, also, for parallels in the content of the two texts; and again we must limit our examination to the passages in Compotus correctorius which concern Church usage. Here, of course, we find much similar material. Argumenta, for instance, for finding the leap-year⁷⁴ or the year of the cycle of epacts⁷⁵ are common to both works; and the texts contain rather similar descriptive passages on topics like the months of the year. But argumenta are a common feature of compotus, appearing either independently or incorporated into longer treatises,⁷⁶ and so these cannot be positively traced to Compotus ecclesiasticus; and parallels between other passages may very well arise from a common source, rather than because one text is indebted to the other: the material on the months, it can be seen, is differently arranged, and contains some different information, in the two works. Perhaps a more positive relationship can be traced between parallel passages on two more technical topics: both texts deal with the ogdoas and endecas⁷⁷ and with the position of the embolism,⁷⁸ and use

⁷³Compotus correctorius p.225.

⁷⁴Compotus correctorius p.218; Compotus ecclesiasticus p.220.

⁷⁵Compotus correctorius pp.249ff; Compotus ecclesiasticus pp.260-1.

⁷⁶See below, pp.143-4.

⁷⁷Compotus correctorius pp.244-245; Compotus ecclesiasticus pp.245-7.

very similar lines of argument.

If Grosseteste knew the Computus ecclesiasticus, it is noteworthy that he chose to exclude any reference in his own work to the manual computus which plays a conspicuous part in the earlier treatise. Manual computus was a technique which was closely related to the old methods of calculation,⁷⁹ and Grosseteste was working with the new ones.

It is at least possible that the structure of the Computus ecclesiasticus influenced the Computus correctorius. Southern tells us that Grosseteste was not "by nature a tidy organizer of material from the past".⁸⁰ Compared with much of his other scientific writing, Computus correctorius is noticeably tightly structured. It is possible that in broad outline Computus correctorius is indebted to Computus ecclesiasticus. Both deal with the solar and the lunar calendars, before discussing the complications caused by the combination of the two. Inside this framework, however, much of the material is differently ordered, and it is possible that Grosseteste was influenced by another, older tradition; for the structure of Computus correctorius, like that of the Computus of Roger of Hereford, is dictated in

⁷⁸Computus correctorius pp.249ff; Computus ecclesiasticus pp.249ff.

⁷⁹See below, pp.148-50.

⁸⁰R.W.Southern, Robert Grosseteste p.46.

part by reference to calendar tables.⁸¹

If, as I have suggested, the Compotus ecclesiasticus was a standard quadrivium text in the Oxford Schools, it would be reasonable to suppose that Grosseteste knew it. Compotus correctorius is in no sense an adaptation of the earlier text, unlike the De anni ratione of John of Sacrobosco, which will be discussed next; but Compotus ecclesiasticus is arguably part of the source material for Grosseteste's treatise, digested and made his own by one of the most powerful minds of the 13th century. It might still, however, be dangerous to assume that the title of his treatise contains an explicit reference to the earlier work. The reference could in fact be more generally to the Church calendar, the one in everyday use; and this interpretation is borne out by the heading given to the treatise in Steele's edition, which appears in the thirteenth century BL Add 27589:

Compotus venerabilis patris domini et sancti Roberti
Grossi capitis Lincolniensis episcopi factus ad
correctionem communis kalendariis nostri⁸²

⁸¹Compotus correctorius p.223: Patet itaque jam nobis via per tabulam suprapositam et per nunc dicta, qualiter sine exemplari componamus kalendarium: Oxford Bodl.Ms Digby 40 fol 23r: Bene autem videtur proposito congruere tractatui ut cum singula in scripto contenta breviter in tabulis contineantur earum descriptiones ipsasque tabulas proposito opere preponere.

⁸²Bl Add. 27589, fol.77; R.R.Steele, Opera hactenus inedita p.212.

The copyist is very certain of the author of the Compotus correctorius: it is worth noting that he does not give any ascription to the copy of the Compotus ecclesiasticus which is contained earlier in the same codex.

Compotus ecclesiasticus and the De anni ratione.

I have suggested that the Compotus correctorius of Robert Grosseteste is, to some extent, indebted to the Compotus ecclesiasticus. A comparison of the Compotus ecclesiasticus and the De anni ratione of Grosseteste's more popular contemporary, John of Sacrobosco, which is printed in the appendix of this edition, shows that the two works have much material in common. As I have said earlier, they have sometimes been regarded as identical by cataloguers. They may, however, be differentiated by their incipits. W.M.Stevens cites three separate incipits in his list of MSS of Sacrobosco's treatise:

1. Compotus est scientia considerans tempora distincta secundum motum solis et lune.
2. Compotus est scientia considerans tempora ex solis et lune motibus.
3. Scientia opponitur ut genus.⁸³

The second of these incipits is the beginning of the

⁸³Dr Stevens kindly sent me this list, which forms part of his forthcoming catalogue of computistical works (promised, alas, in 1979 - see p.8n).

printed edition of the De anni ratione, and of all the ascribed MSS versions I have examined. The first and third belong to the Compotus ecclesiasticus. The first is cited by Thorndike and Kibre with a reference to Oxford, Corpus Christi College 293B: they assign the third, with a query, to Sacrobosco.⁸⁴ Stevens observes; "There may be several versions of this work", although the text to which he refers, Tractatus de computo noviter correctus, is not one of them.⁸⁵

Only Poorter, in all the catalogues I have seen, describes a text which appears to be Compotus ecclesiasticus in any detail. It is contained in Bruges MS 524, fols. 37ra-42ra, and is entitled as Compotus prosaicus, presumably to distinguish it from the metrical compotus of Alexander de Villa Dei.⁸⁶

Poorter regarded this text as a "redaction" of the De anni ratione, but his impression that it was less scientific should have made him wary of suggesting that it was predated by the latter. He was perfectly correct, however, if the text is a copy of the Compotus ecclesiasticus, in

⁸⁴Thorndike and Kibre 242, 1403.

⁸⁵Vienna NB Lat. 5239 fols. 10-28v. The writer is not John of Sacrobosco, and the text appears to be a 14c commentary on the Compotus ecclesiasticus, written in a quite horrible hand. See Kaltenbrunner, Vorgeschichte der Gregorianische Kalenderreform p.21.

⁸⁶A.de Poorter, Catalogue des Manuscrits de la Bibliothèque publique de la Ville de Bruges (Gembloux/Paris 1934), p.619.

seeing that the two works are related. The De anni ratione is longer than the Compotus ecclesiasticus, but there are many passages which are common to both.⁸⁷ A comparison of the two works will show that Sacrobosco has expanded his original, making his own treatise both more "scientific" in its specific references to newly-available sources, and more literary. But the De anni ratione is more than a mere expansion of the Compotus ecclesiasticus: it is an innovatory work as well; and Sacrobosco's new ideas are usefully indicated for us by the lively-minded scholar who made the abbreviated version of the Compotus ecclesiasticus that is contained in Dublin, Trinity MS 441. His aim is, he says, to record the material which has been omitted or dealt with less clearly or in a different way in the "other compotus".⁸⁸ Happily he identifies the "other compotus" by the marginal note scilicet 44(fol.107v) to which reference has already been made,⁸⁹ for this would appear to be his deduction from the verses which can be found, in the printed edition and in most MSS, at the end of the De anni ratione:

quater
M.Christi bis C quarto deco_o anno,
De Sacrobosco discrevit tempora ramus.

⁸⁷See appendix, where these passages are italicized.

⁸⁸Dublin, Trinity MS fol.107v: Que vel dimissa sunt in alio tractatu compoti vel minus lucide vel aliter dicat quam ibi hic reperri possunt.

⁸⁹He is addicted to this type of intelligent comment. See fol.104r, where he works out the cube root of 123456789. Unfortunately he arrives at the wrong answer.

Gratia cui nomen dederat divinus Joannes,
Annuat haec nobis huius sic carpere fructus,
Ecclesiae Christi, quod nos hinc fructificemus.⁹⁰

Thorndike tells us that these lines are "not by Sacrobosco and do not represent his dating" of the De anni ratione,⁹¹ and indeed, the presens annus is given variously as 1232 or 1235 in the text itself. He suggests that "they were occasioned by his death", and Pedersen has found evidence that the description of Sacrobosco as one who discrevit tempora was derived from an inscription on his tomb, now destroyed, at Saint-Mathurin in Paris.⁹² But it is probably safe to assume that the text of the De anni ratione to which the Trinity copyist had access contained the date 1244, and the marginal comment is in itself evidence that the rather cryptic bis C quarto deço anno is to be interpreted in this way, rather than as the 1256 suggested by some earlier commentators.⁹³

What was it, therefore, about the Computus ecclesiasticus that interested the Trinity copyist? The codex, which is written throughout in the same 14th century hand, contains much material of a far more advanced kind. A comparison of

⁹⁰p.508.

⁹¹Lynn Thorndike, The Sphere of Sacrobosco and its Commentators (Chicago/London 1949), p.7

⁹²Olaf Pedersen, "In quest of Sacrobosco", 181

⁹³See The Sphere of Sacrobosco p.7

his abbreviated text with the fuller text more usually found shows that the passages which have been copied in full are those for which Sacrobosco has substituted his innovatory calculations. There is one exception to this: a passage on the ogdoas and endecas - ut melius pateat ortus embolismorum saltus lune, de quo patebit inferius,⁹⁴ which is omitted by Sacrobosco, but which appears, as has been said, in a somewhat similar form in the Computus correctorius of Grosseteste.

The other passages which the Trinity copyist recorded fully are as follows:

Julius Cesar et alie 365 dies et VI horas⁹⁵

unde in Matheo illum oportet crescere similiter intelligendum de equinoctiis⁹⁶

perceperunt enim compotiste pro loco et tempore verificatur⁹⁷

These are all, as I have said, passages which involve calculations, carried out here using the moments, uncie and

⁹⁴Trin.441 fols.108v-109r; pp.245-47 of this edition.

⁹⁵Trin. 441 fol.106v; pp.217-18.

⁹⁶Trin.441 fol.107v; pp.230-231.

⁹⁷Trin.441 fols.110r-110v; pp.261-263.

atoms of the earlier system of time-measurement.⁹⁸ Sacrobosco's innovation was to use the sexagesimal system. He gives notice of his intention at the beginning of his treatise: having detailed the parts of time in the traditional manner, he observes:

Astronomica tamen per 60 usque ad minimum cuiuslibet integri, uniformis est fractio⁹⁹

and this, as has been said, is the system he uses for all his calculations. The earlier system remains as a kind of fossil in the text, and is not referred to again: it is as though a writer of a modern arithmetic book were to describe the old monetary system of pounds, shillings and pence, and then work all his examples in decimal coinage.

Sacrobosco's application of the sexagesimal system to computistical calculation was seen to be truly innovatory, and although this appears to have gone unrecognised by later commentators,¹⁰⁰ it is something that his contemporaries were aware of, and thought worth recording on his tomb: despite the fame of his Sphere, for them he was the computista who tempora discrevit - "divided time" - not,

⁹⁸See below, p.279ff.

⁹⁹p.430.

¹⁰⁰See, for instance Steele, Opera hactenus inedita p.290, where Grosseteste and Bacon are the first writers who are credited with using it.

pace Pedersen, "sorted out the aspects of time".¹⁰¹ Of course, he was not the first writer in the West to use the sexagesimal system: the credit for this appears to belong to Walcher of Malvern, or possibly with more justice to Peter Alfonsi;¹⁰² but it was used by these writers not in compotus but in an astronomical setting, in calculations involving the 360 degrees into which the ancient Babylonians had divided the zodiac.

The virtue of the new system was, as Sacrobosco observes, that uniformis est fractio. Moreover, the number 60 has more factors than any other number smaller than 100.¹⁰³ The system it superseded had no such uniformity. It might be noticed in this context that Grosseteste, unlike Sacrobosco, applies it with characteristic consistency: in the Compotus correctorius a "minute of a day" is one-sixtieth of 24 hours, i.e., 24 minutes.

Why, we may ask, given the obvious advantages of applying the sexagesimal system to time, does the Trinity copyist consider that "some things" in the "other compotus" were dealt with less clearly, minus lucide, than in the Compotus ecclesiasticus? It is, after all, with modifications, the system which is still in use today. Perhaps because he is

¹⁰¹Olaf Pedersen, "In quest of Sacrobosco" 181.

¹⁰²See Haskins, Studies, pp. 115-116.

¹⁰³Thus Campanus de Novara, Computus Maior (Venice 1518), 160v: Numerus autem .60. plures habet partes quam alius numerus minor .100.

particularly interested in mathematics, he was disturbed by the inaccuracy of some of Sacrobosco's calculations. There is also the question of orthodoxy.¹⁰⁴ Some of Sacrobosco's assumptions were, it will be argued, dangerously innovatory; the Computus ecclesiasticus was still being studied as a standard schools text in the fifteenth century.

A comparison of the Computus ecclesiasticus and the De anni ratione must lead to a reassessment of the latter. Pedersen held that Sacrobosco's work was "planned on a large scale, revealing a very logical and orderly mind". Unless the Computus ecclesiasticus could be shown to be an earlier draft of the De anni ratione, these characteristics are not Sacrobosco's. And Professor Pedersen himself considers that the apparent date of the Computus ecclesiasticus makes this unlikely.¹⁰⁵

There is textual evidence, in fact, that the De anni ratione is not an original treatise. It appears under various titles, including Computus ecclesiasticus. The title of the 1538 edition gives this as an alternative to De anni ratione. In some MSS the treatise is described as a Computus philosophicus, and this is a more appropriate name according to the definition of Alexander de Villa Dei.

¹⁰⁴See below, p.118ff.

¹⁰⁵Professor Pedersen was kind enough to discuss this point with me when I met him in Cambridge in 1989.

Perhaps Compotus ecclesiasticus was carried over from the earlier work. More significantly, the treatise is often described as a nova compilatio, as for instance in the MS that Professor Pedersen studied:

Nova perutilis compoti compilatio Johannis de Sacrobosco¹⁰⁶

The primary sense of compilatio is "a raking together, pillaging, plundering". It would appear that Sacrobosco's contemporaries were aware of his debt to the earlier treatise. All the versions of the "account of writers on compotus" quoted earlier, it will have been observed, use this description, and in the commentary which is devoted specifically to the De anni ratione, although the text is obscure, it would appear to imply that Sacrobosco's work is based on the earlier treatise.

The De anni ratione: additions and alterations.

The additions and alterations that Sacrobosco made in his adaptation of the Compotus ecclesiasticus are evident if the text is compared with the De anni ratione. They are in the main literary and astronomical. The appended table of citations¹⁰⁷ shows how Sacrobosco increased the number of quotations from Ovid's Fasti, and added material from other

¹⁰⁶ Copenhagen MS GKS 277, fol.89vb.

¹⁰⁷p.130.

Classical poets. The Computus ecclesiasticus cites directly a contemporary ecclesiastical writer, John Beleth. Material from the De ecclesiasticis officiis appears in the De anniratione but it is not acknowledged; here the only contemporary reference is to a philosophical writer, Bernardus Silvestris. The De somno Scipionis of Macrobius is quoted, a work that does not appear in the Computus ecclesiasticus.

The two treatises agree in distinguishing computus, which studies the movements of sun and moon, from astronomy, which deals with all the planets: much of the detail that Sacrobosco adds might be classed as astronomical rather than computistical. What is more significant, however, is that Sacrobosco, unlike the writer of the Computus ecclesiasticus, is concerned with the exact division of time, applying the "new science" of Ptolemy to construct his own solutions to the problems of the calendar.¹⁰⁸

One of these problems is the inaccurate measurement of the tropical year in the Julian system; and this problem had already been tackled in the Computus ecclesiasticus.¹⁰⁹ Sacrobosco proposes his own solution, based on Ptolemaic measurements, recommending that the leap-year day at the end of every 288-year period should be omitted. The other problem involved the Nineteen-year Cycle: inaccurate

¹⁰⁸See Olaf Pedersen, "In quest of Sacrobosco", 208-213.

¹⁰⁹See below, pp.313ff.

measurement and the inherent incommensurability of the solar and lunar cycles had resulted in what Steele happily called the "ecclesiastical moon".¹¹⁰ As Sacrobosco says,

Nunc igitur luna dicitur prima, ubi deberet dici tertia, vel potius quarta.¹¹¹

But to propose a solution to this anomaly was to disobey the Church, as Sacrobosco makes clear:

Set quia in Concilio generali aliquid de Calendario transmutare prohibitum est, oportet modernos adhuc sustinere huiusmodi errores¹¹²

There is no parallel in the Computus ecclesiasticus to the passage in which Sacrobosco discusses the Nineteen-year Cycle, although unease with it is demonstrated in the promise which appears in some MSS of the earlier treatise to tackle the problem of the saltus lune.

The Computus ecclesiasticus is strictly orthodox in its approach to the calendar. To discuss the errors of the Nineteen-year Cycle was to impugn the decisions of the Council of Nicaea; to criticise the Julian year did not involve criticizing the Church. It is noteworthy that in another area of controversy, that of the date of the

¹¹⁰Steele, Opera hactenus inedita p. vii.

¹¹¹p.481-482

¹¹²p.482.

Incarnation, the writer of the Compotus ecclesiasticus plays for safety. Gerland's emendation of the Dionysian Cycle was too well-known to be ignored, but it had not received the approval of the Church, as the Commentary in Oxford, Bodl. MS 193 makes clear.¹¹³ Our writer associates himself with Gerland rather than with Dionysius and Church usage in his discussion of the concurrent,¹¹⁴ but it is the latter system which he expounds.

When we turn to Sacrobosco's treatise, we must be struck by its unorthodoxy. Not only does he deal with the errors of the Nineteen-year Cycle, admittedly with the proviso that the Church must be obeyed, but he comes down very firmly in favour of Gerland's emendation of the Dionysian Cycle. In fact, so much is Gerland taken for granted that his name is not given until later:

Discretio igitur Cycle solaris secundum veritatem et utilitatum considerationem, in his habetur versibus:¹¹⁵

The verses, it should be explained, give the concurrents for Gerland's Cycle.¹¹⁶ A mnemonic for the Dionysian Cycle

¹¹³Oxford, Bodl MS Digby 193, fol.27rb: Unde eius editio ab ecclesia non accipiebatur.

¹¹⁴p.222.

¹¹⁵p.461.

¹¹⁶See below, pp. 308-309.

is given as a sort of afterthought, and an argumentum supplied to calculate the year in relation to Gerland's. The mnemonic appended to this makes it plain that Dionysius was mistaken. It is noticeable that Grosseteste is much more cautious about advocating Gerland, whom he does not name at all.¹¹⁷

I have said that it was possible to criticize the Julian year and remain orthodox, as the Compotus ecclesiasticus does. But Sacrobosco's solution to the backward shift of the solstices and equinoxes manages to run counter to Church teaching. His estimation of the length of the tropical year leads him to the conclusion that since the solstices and equinoxes are now ten days behind the festivals traditionally associated with them, and since the overestimation of the tropical year, according to his reckoning, amounts to one day in 288 years, at the time of the Incarnation the solstices and equinoxes must already have shifted back by six days:

relinquitur quod tempore Nativitatis Domini, et beati Ioannis in sexto die praecesserit Solstitium, et sic nunc est in decimo¹¹⁸

¹¹⁷Compotus correctorius, p.231: si autem voluerimus ordinare ciclum solarem per modum alium

¹¹⁸p.34. One copyist at least seems to have been puzzled by Sacrobosco's assertion. In Copenhagen MS GKS 277, which Pedersen used as a basis for his article on Sacrobosco, the phrase reads: et sic non est in decimo. Pedersen, "In quest of Sacrobosco" 221 emends non to nunc, without comment.

The problem with this is that the association of Our Lord's birth with the winter solstice, and St John's birth with the summer one, was vouched for by the authority of Holy Scripture: the text illum oportet crescere, me autem minui (John, 3.30) was traditionally interpreted to mean that "when Our Lord was born the days began to increase, when John was born to decrease".¹¹⁹ It is a commonplace of computi from Bede onwards. Sacrobosco, perhaps wisely, omits it from his text.

If the De anni ratione is unorthodox in its approach to calendar problems, who was it intended for? The assumption that it was conceived as a textbook for young liberal arts students must, I think, be disputed. John of Sacrobosco's teaching career appears to have been spent entirely in Paris,¹²⁰ but there would seem to be, as has been said,¹²¹ no evidence that computus was taught at Paris as part of the liberal arts course in the thirteenth century. Again, the liberal arts students were young and inexperienced. Pedersen pictures them as "young boys with blank minds and no previous education".¹²² It seems unlikely that students of this kind would have been presented with a theologically unorthodox text.

¹¹⁹p.230.

¹²⁰Olaf Pedersen, "In quest of Sacrobosco", 195ff.

¹²¹See pp.41ff.

¹²²"In quest of Sacrobosco" p.195.

It has generally been held that in Oxford as well as in Paris, the De anni ratione was used as the basic quadrivial text. For one fifteenth century student at least, this was not so. In a codex which contains the Algorism and the Sphere of Sacrobosco, he has copied not the De anni ratione, but the Compotus ecclesiasticus.¹²³

I would argue that we should assume that the De anni ratione was written as an extra-curricular text, based on the Compotus ecclesiasticus. This would accord with the views of Guy Beaujouan. In a paper which is concerned primarily with the Algorism, he discusses the discrepancy between the absence of official documents that mention Sacrobosco's works, and the evidence that they were in fact well-known, and concludes that they must have been studied outside the regular curriculum.¹²⁴ The Algorism, like the De anni ratione, is a derivative text. We should see Sacrobosco, therefore, not as lecturing to young and immature liberal arts students, but commenting and elaborating on elementary works for more advanced groups from which mathematicians of the calibre of Peter de Marincourt could emerge. Pedersen himself points to this conclusion in his discussion of the medieval Corpus astronomicum. The MSS he describes would scarcely have been

¹²³See p.170ff.

¹²⁴Guy Beaujouan, "L'enseignement de l'arithmétique élémentaire à l'université de Paris aux xiii et xiv siècles", Homenage a Millas-Vallicrosa I (Barcelona 1954), p.100. See above, pp.43.

appropriate to the elementary arts course; indeed, as he himself suggests, many of them are "aimed at the education of computistae, or astronomers with a specialised interest in time-keeping".¹²⁵

John of Sacrobosco, Robert Grosseteste and the Sphere.

In both the Algorism and the De anni ratione, Sacrobosco appears to have been a compiler rather than an originator. It is possible, I believe, to show that he used the same method in his most popular work, the Sphere. The evidence for this is to be found in material in a thirteenth century codex, Cambridge Univ. MS FF.vi.13, to which S.H.Thomson gave the title De universitatis machina,¹²⁶ and which was described in detail by Lynn Thorndike in his edition of Sacrobosco's Sphere.¹²⁷ The material is puzzling. It follows an ascribed copy of Grosseteste's Sphere, and begins with three paragraphs that are to be found, in very similar form, in the Sphere of Sacrobosco: Universitatis mundi machina in duo dividitur...; Circa quidem elementarum regionem....; Quarum quidem duo sunt motus....¹²⁸ There follow other passages

¹²⁵Olaf Pedersen, "The Corpus astronomicum and the traditions of medieval Latin astronomy", Studia Copernicana 3 (1973), 76.

¹²⁶S.H.Thomson, The Writings of Robert Grosseteste pp. 118-9.

¹²⁷Lynn Thorndike, The Sphere of Sacrobosco pp. 65-67.

¹²⁸Cambridge Univ. MS FF.vi.13, fol. 17v; cf. Sacrobosco, Sphere, pp. 78-9.

which are to be found word for word in Sacrobosco's treatise. Thorndike considered that this material finished at fol.20r, apart from some diagrams, and that the incipit on 21r, Salomon ait, Qui observat ventos non seminat marked the beginning of "an elaborately illustrated anonymous astronomical treatise which seems quite distinct from the Sphere". It is followed by the Sphere of Sacrobosco, with some variations, and on fol.37v the three paragraphs which are to be found in Sacrobosco's treatise are repeated, in almost the same form. On fol. 38r, according to Thorndike, a new "tract or fragment" begins with the incipit Kalendario dispositio solis et lune motum exequitur, but if this is a new beginning, there is nothing in the text to mark it as such; and Thorndike does not record the explicit on fol.43v: Explicit tractatus magistri Roberti Lincolniensis episcopus cognomento Grosseteste.

It was this ascription that interested S.H.Thomson. He considered that the codex contained two versions of a treatise by Grosseteste, the first (which contains references to more modern scientific material) being a reworking of the second by Grosseteste or a pupil.

What is to be made of all this? It led Thomson to suggest "a reexamination of the chronology of the literary activity of Sacrobosco in the light of the possibility of a larger borrowing from Grosseteste than has hitherto been considered". That there were parallels between the two

treatises on the Sphere was suggested first by Baur: they seem slight enough.¹²⁹ Thorndike considered that both similarities and differences between the two works were "much greater and more impressive than Baur indicated". His tentative conclusion was that Grosseteste's Sphere was derived from Sacrobosco's.¹³⁰ It is a relief to read Sir Richard Southern's straightforward declaration: "There is no evidence that either author borrowed from or was influenced by the other".¹³¹

There is evidence that apparent parallels between the treatises of Sacrobosco and Grosseteste are the result of borrowings from a common source which resembles the material which is to be found in the codex which has just been described. And sometimes the two writers borrow different material. The three paragraphs beginning Universitatis machina in duo dividitur est which are to be found in Sacrobosco's treatise do not appear in Grosseteste's. On the other hand, the phrase cuius efficiens est anima mundi which appears in the Sphere of Grosseteste occurs in identical form in the Cambridge codex.¹³² And Grosseteste appears to have used the same

¹²⁹Ludwig Baur, Robert Grosseteste. Die philosophischen Werke (Beiträge zur Geschichte der Philosophie des Mittelalters, Munich 1912), p.64*

¹³⁰Thorndike, The Sphere, p.14.

¹³¹R.W.Southern, Robert Grosseteste, p.145.

¹³²Grosseteste, Spera, p.13; cf. Camb.Univ.MS FF.vi.13 fol.17v.

source for some of the material which is to be found in the Computus correctorius.¹³³

Is it possible that the material in the Cambridge codex represents a compendium of extracts from both Sacrobosco and Grosseteste? It has to be said that the material which Thomson saw as two versions of the same treatise is written in continuous form, and has none of the disjointedness that is usually associated with extracts of this kind. And it is of particular interest that some at least of the material would appear to date from much earlier than the treatises of either Sacrobosco or Grosseteste, since it appears also in the Computus of Roger of Hereford. This would appear to preclude Grosseteste's authorship of at least the less "scientific" version of the text, although it is this which bears the ascription to the latter.¹³⁴ The whole topic deserves more detailed examination than be given here. In the words of some MSS of the Computus ecclesiasticus, it is something que alias pro loco et tempore verificatur.

Computus ecclesiasticus and the Massa compoti.

The relationship between the Computus ecclesiasticus and the Massa compoti of Alexander de Villa Dei is a puzzling

¹³³Cambridge University MS Ff.vi.13 fol. 25r; Robert Grosseteste, Computus correctorius p.219.

¹³⁴Cambridge Univ.Ff.vi.13 fol.43v: Explicit tractatus magistri Roberti Lincolnensis episcopus cognomente Grosseteste

one. They cover much the same ground, and many of the mnemonics which occur in the former are to be found in the latter. Where content is concerned, two passages in the Massa compoti are particularly significant: firstly, Alexander's reference to astra sequentes, i.e., astronomers, in relation to the beginning of the day; and secondly the inclusion, in metrical form, of a method of reforming the calculation of the length of the tropical year which is identical to that found in the Computus ecclesiasticus.¹³⁵ There are, at the same time, striking differences: Alexander's material is arranged in a different order, and is followed in most MSS by the Doctrina tabularum.¹³⁶

Could both treatises have been written by Alexander? The fourteenth century commentator Master Conrad appears to have been uncertain of the authorship of the Computus ecclesiasticus. As has already been said, he dismisses the claim that Robert Grosseteste wrote the treatise,¹³⁷ but on the next folio he confuses it with the Massa compoti. The book on which he is commenting, he tells us, begins either Incipit massa computi or alternatively Incipit computus ecclesiasticus.¹³⁸

¹³⁵See pp.282ff; 346ff.

¹³⁶Massa compoti pp.61-64.

¹³⁷See above, p.94.

¹³⁸See above, pp.87.

It would seem unlikely, despite Master Conrad's comment, that Alexander could have been responsible for both texts. Alexander particularly disliked the use of Ovid's Fasti in calendar works, as he tells us in the Ecclesiale:

Falsum de fastis fatuus legat; ecclesialis
vera kalendaris sit cara scientia nobis.¹³⁹

We have seen that Sacrobosco quoted verses from Alexander's Carmen de algorismo in his Algorism, and it is possible that the writer of the Computus ecclesiasticus plundered the Massa compoti in the same way. But Alexander himself tells us that he is calling his treatise Massa compoti because it has been collected from many other works, in the same way that many layers of copper are moulded into one mass.¹⁴⁰ The verses on the golden number sometimes appear as a separate text, and Cordoliani recorded one such occurrence in an MS which would seem to predate Alexander.¹⁴¹ The author of the Computus ecclesiasticus could have found these verses, and many other that occur in both treatises, elsewhere than in Alexander's text.

¹³⁹Alexander de Villa Dei, Ecclesiale, ed. L.R.Lind, (Lawrence 1958), p.11. The special target of his wrath was a commentator called Arnoul de Sainte-Euverte: see E.H.Alton, "The medieval commentaries on Ovid's Fasti", Hermathena 20 (1930), 124.

¹⁴⁰Massa compoti p.52: Et quoniam de pluribus aliorum operibus liber iste colligitur, ideo librum istum vocare volui MASSA COMPOTI.

¹⁴¹A.Cordoliani, "Contribution à la littérature du comput ecclésiastique au moyen âge", Studi medievali ser.1. 1, (1960), 184: Paris Bibl.nat.lat. 2949 fol.113v s.xii.

It would seem fairly clear that both works were the product of a similar intellectual environment, and of a similar computistical tradition. The account of writers on the Compotus which appears in Cambridge MS Gonville and Caius 137 described above includes Alexander with Robert Grosseteste and John of Sacrobosco as successors to Bede, Helperic and Gerland.¹⁴² Since Alexander himself disclaimed originality for his work, we should be wary of attributing any innovations to him personally.

It has generally been accepted that the Massa compoti dates from 1200, but this is on the evidence of the text itself.¹⁴³ The commentary on compotus cited above appears to imply that the Massa compoti was written later than the De anni ratione and the Compotus correctorius.¹⁴⁴

4. Provenance.

It will be clear from the foregoing that it has been impossible to suggest any but the vaguest provenance for the Compotus ecclesiasticus. It would seem to belong to a computistical tradition which had its origins in the West

¹⁴²See above, pp.81-82.

¹⁴³W.E.van Wijk, Le Nombre d'Or p.47.

¹⁴⁴Cambridge MS Gonville and Caius 137 fol 92v: Et quia omnes predicti processerunt pro laici et difficili quia modo physico quidam magister Alexander de Villa Dei modo ecclesiastico et metrice compotum utilem et brevem ad utilitatem omnium illum edidit audiencium.

of England, but although the majority of MSS I have seen are English, the text must have been circulating in Paris before the middle of the century, where John of Sacrobosco studied it; and it was widely enough known to have been copied in Spain in the fourteenth century.¹⁴⁵ It is to be hoped that further investigations will produce many more MSS of the treatise, and perhaps positive evidence of its origins.

It is my intention to devote the rest of this dissertation to a detailed examination of the Computus ecclesiasticus.

¹⁴⁵See Bodl.MS Can.Misc.71: see below, p.172.

Appendix to Chapter III: comparison of citations.

Comptus ecclesiasticus.

Augustine.

Bede.

Boethius.

Cicero.

Dionysius.

Gerland.

Glossa ordinaria.

Jerome.

John Beleth.

Ovid.

Theophilus.

De anni ratione

Alfraganus.

Augustine.

Bede.

Bernard Silvestris.

Boethius.

Claudian.

Dionysius.

Eudoxus.

Eusebius.

Galen.

Gamaliel.

Gerland.

Hippocrates.

Jerome.

Josephus.

Lucan.

Macrobius.

Martianus Capella.

Ovid.

Plato.

Ptolemy.

Theophilus.

Chapter IV.

Computus ecclesiasticus: content and sources.

Part I: Content.

1. Calendar lore.

Modern commentators on the monastic computistical tradition often use the term computus to mean an encyclopaedic collection of material some of which is only loosely related to the calendar.¹ It is worth noting that this convenient usage seems to be a recent one, and that in the Middle Ages, computus meant either the science of time-reckoning, or a specific treatise devoted to that science. Nevertheless, many computistical treatises retain some of the all-embracing character of the earlier collections, containing material which might seem to be only distantly related to computus. Some of the finest passages in the Bede's De temporum ratione have very little to do with computus as such.² Other later Compoti, like that of Roger of Hereford, contain much which is astronomical rather than computistical in substance. The Computus ecclesiasticus is

¹See W.S.Stevens, Rabani Mogontiacensis Episcopi De computo (C.C.cont.med.XLIV, Turnhout 1979), pp.167-168 for a description of this sort of material.

²See, for instance, C.W.Jones, Beda's Opera de Temporibus on DTR cap.vi, p.338-9: "Bede's treatment of the mystical significance of Easter, expanded in DTR lxiv, is one of the finest in literature, surpassing Augustine's letter to Januarius (Ep.LV) on which it is based".

noticeably uncluttered by extraneous material, but it is far more than a mere practical manual. In considering the writer's sources, therefore, we have to deal not only with the theory and practice of compotus, but also with material of a literary or historical nature which I shall call "calendar lore". It is scattered throughout the text, and enlivens what in the hands of some writers could be an arid subject.³ Much of it is from traditional sources, but of particular interest are what appear to be later additions, originating either with the writer himself, or as a result of the inclusion of compotus as a quadrivium subject in the Schools curriculum.

2. Theory.

The De temporum ratione was the basis for all later treatises on the calendar; but that did not mean that it could not be added to or changed. Bede himself was aware of defects in the ecclesiastical calendar; and from the tenth century on, proposals for emending it were made.⁴ Much of what the writer of the Compotus ecclesiasticus has to say about the theoretical basis for his treatise is traditional enough; yet his apparently orthodox approach masks the fact that the treatise seems to have been produced in a

³See, for instance, the starkly mathematical treatise of Reiner of Paderborn, ed. W.E.van Wijk, "Le Comput emendé de Reinherus de Paderborn (1171)", Verhandelingen der Koninklijke Nederlandse Akademie van N.R.57/3).

⁴See pp.313ff.

sophisticated environment in which calendar problems and the new Arabic science were eagerly discussed. One such problem was the disparity between the actual position of solstices and equinoxes and the Church's placing of them. The solution proposed in the Compotus ecclesiasticus is truly innovatory, and for this reason will be examined in a separate section in the Commentary that follows the edition.⁵

Compotus ecclesiasticus and Arithmetic.

The theoretical basis of compotus is mathematical. The usual derivation of the word is from computando; not because compotus teaches the art of calculating, but because calculation is essential for it.⁶ Not all writers took the subject so seriously. In his Liber particularis, written around 1230, Michael Scot cites many Arabic authorities - he was "steeped in Arabism", in Richard Lemay's phrase⁷ - and he was aware of the problems of the solar and lunar cycles, but he has no contribution to make to compotus. He makes a joke about the meaning of the word, which incidentally confirms that compotus rather than computus was the commoner spelling in the 13th century:

⁵pp.313ff.

⁶Thus Alexander de Villa Dei, Massa compoti p.52: dicitur compotus a computando; non quia computare doceat, sed quia computando docetur.

⁷Abu Ma' Shar and Latin Aristotelianism in the Twelfth Century: The Recovery of Aristotle's Natural Philosophy through Arabic Astrology (Beirut 1962), p.xxvi.

dicitur computus a compoto, vel a computando, non quia in compoto agatur disputationibus, sed quia computationes necessarie sunt ad doctrinam eorum qui in compoto edocentur⁸

Such a light-hearted attitude would have been impossible for later writers, imbued with the new science. The Computus maior of Campanus de Novara dates from 1270. He cites Robert Grosseteste, and quotes numerous Arabic authorities, and refines the derivation given earlier:

Ideo a computando iste scientie nomen accipit. Unde manifestum est quod qui idoneus scientie computi vult esse discipulus, oportet eum in numerorum computationibus esse expertum⁹

The Computus maius of Campanus is full of mathematical expertise. The Computus ecclesiasticus which is the subject of my study is of an earlier kind, using traditional methods, and aimed at readers without advanced skills in handling numbers. This is not to say that the earlier computists did not have complicated calculations to perform, but that they had to make far more use of memory. Bede, for instance, suggests that his readers should commit

⁸Michael Scot, Liber particularis, Oxford, Bodl. MS Can. Misc.555, fol.10vb. For information on this writer, see Lynn Thorndike, Michael Scot (London 1965).

⁹Computus maius Campani Navariensis (Venice 1518), fol.159r.

to memory the products of 59 (the number was significant because it was the sum of two lunations in the lunar year).¹⁰ The group of compoti to which the Computus ecclesiasticus belongs was the last which did not involve a knowledge of algorism. It is interesting that treatises of this kind continued to be copied, even, on the evidence of one MS, into the fifteenth century.

Where did the later computists (I use this spelling advisedly here) gain their expertise in numbers? The answer lies in the Algorism. The title is a garbled form of the name of the Arab writer Al-Khwârisimî, whose treatise on arithmetic was the channel through which our modern numerals, usually called Arabic, but in fact Indian in origin, reached the Christian West. The treatise itself has disappeared, but it was available in at least three versions in the twelfth century. The Liber ysagagorum Alchorismi has already been mentioned.¹¹ Two more twelfth century treatises on algorism were described by L.C.Karpinski.¹² It was, however, through the thirteenth century works of John of Sacrobosco and Alexander de Villa Dei that the new arithmetic became generally accessible.

¹⁰DTR p.224: Iuvat huiusce argumenti usum si calculator ultima quinquagesimae nonae partis diligentius memoriae commendat

¹¹See pp.58-59.

¹²L.C.Karpinski, "Two twelfth century Algorisms", Isis 3 (1921), 396-413.

Algorism appears as a statutory set-book in Oxford before 1307.¹³ As has been said, there is no similar occurrence in contemporary Paris statutes, but the works of both writers appear to have been well-known. The introduction of the Algorism into the Schools was to transform the Quadrivium. Before this happened, the basic arithmetic textbook was the De arithmetica of Boethius.¹⁴ What it provided for the well-read "Arts" man was a philosophical interest in numbers.¹⁵ Moreover, the traditional astronomical texts - Macrobius's Commentary on the Dream of Scipio, Chalcidius on the Timaeus, the De nuptiis of Martianus Capella - were descriptive rather than mathematical. Neither arithmetic nor astronomy as pursued in the early Schools required the application of mathematical principles. Hugh of St Victor in the Didascalicon described a course of studies which embraced practical, as well as theoretical knowledge,¹⁶ but devotion to "pure learning" was an honoured tradition which had its origins in classical antiquity: practical arithmetic had its everyday uses, but it found no place at first in the Schools.

¹³Statuta antiqua Universitatis Oxoniensis, p.33.

¹⁴De institutione arithmetica, ed. Michael Masi, Boethian Number Theory (Studies in Classical Antiquity 6, Amsterdam, 1963).

¹⁵See Gillian Evans, "The influence of quadrivium studies in the eleventh and twelfth century schools", Journal of Medieval History, 1 (1975), 151-164.

¹⁶Hugh of St Victor, Didascalicon, PL 176, 760. He suggests, however, that the liberal arts are for the liberi, the mechanical arts for the plebei.

The separation of practice and theory in arithmetic broke down because of two developments. The first of these was the introduction into the West of the abacus, with its system of place-values and implicit zero, which enabled the performance of arithmetical processes which were impossible with Roman numerals.

It has been noted that the abacists were also comptotists, and that the calculation of the calendar rather than of tax returns was their main preoccupation. Although R.L.Poole suggested that the skills of the abacist were of great use to the Exchequer,¹⁷ G.E.Evans, more recently, has shown that "the Exchequer board has only the most tenuous claims to be called an abacus".¹⁸ One of the earliest English abacists was Thurkil.¹⁹ His treatise contains illustrations which suggest use by the Treasury, but the operations that Thurkil describes are concerned with multiplication, division and fractions. Of course, while these are essential for comptotus, they are of no use for the Exchequer board. Again, although Robert, Bishop of Hereford was a member of the royal curia, William of Malmesbury writes of his skill as an abacist in the context not of the

¹⁷R.L.Poole, The Exchequer in the Twelfth Century (Oxford 1912), pp.43-57.

¹⁸Gillian Evans, "Schools and scholars: the study of the abacus in English schools c.980-c.1150", English Historical Review 94 (1979),79.

¹⁹See C.H.Haskins, Studies in Medieval Science, pp.331-332.

Treasury but of compotus.²⁰

The first abacists in Europe were Lotharingian. The Lotharingian connection was strong in the West of England,²¹ and it is not accidental that before 1200, a number of mathematically advanced computistical treatises were produced in that area. Karl Menninger observed that "the introduction of Indian numerals and their method of writing fractions really rescued medieval arithmeticians from a nightmare",²² and we shall see something of this nightmare in the course of the Commentary; but the calculations in, for instance, the Compotus of Roger of Hereford, which look horrendous, were presumably less so for a skilled abacist. What is especially daunting for the modern reader is that Roger employs Roman duodecimal fractions,²³ but these would be easier to handle if, as Faith Wallis suggests, they were treated as integers, grouped on the abacus in columns of 12 rather than of 10.²⁴

The second development, the Algorism, as has been said, had

²⁰William of Malmesbury Gesta pontificum ed. N.E.S.A. Hamilton (Rolls Series 1870), p.300: omnium liberalium artium peritissimus, abacum precipue et lunarem compotum et celestium cursum astrorum rimatus.

²¹See above, pp.51ff.

²²Karl Menninger, Number Words and Number Symbols: a cultural history of numbers (tr. Paul Broneer, M.I.T./London 1969), p.159.

²³See below, p.280.

²⁴MS Oxford St John's 17; a Medieval MS in its Context (Ph.D. Thesis, Toronto 1985), p.482.

its beginnings in the Arab world; and its arrival was part of the new science, finding its way initially from the newly Christianised Spain.²⁵

Algorism introduced two new concepts to the West. The first entailed the adoption of the Arabic or Indian number-forms, to replace the Roman numerals which seem so clumsy to us. This was a slow process, possibly because of what Menninger describes as "the highly satisfactory visual quality of the number-groupings" in the Roman notation.²⁶ G.F.Hill, in his survey of MSS using Arabic numerals, continued his researches into the sixteenth century; it was only after 1500 that "the instances became innumerable".²⁷ It is possible that the study of compotus led to an increased use of Arabic numerals, especially since the visual quality of Roman numerals is less obvious the larger they become. Certainly, many of the thirteenth century MSS that Hill lists contain computistical treatises and calendar works. But Menninger believed that the new numbers were adopted "not because of any conception of the advantage of place-value but merely as a new and exotic means of writing numbers".²⁸ The MSS I have seen would support Menninger's view: some of the copyists of the Compotus ecclesiasticus

²⁵See above, pp.57ff.

²⁶ Number Words and Number Symbols p.249.

²⁷G.F.Hill, The Development of Arabic Numerals in Europe (Oxford, 1915), p.9.

²⁸Karl Menninger, Number Words and Number Symbols p.424.

appear to have used the new numerals without any real grasp of their significance: the copyist of MS Bodley Ashmole 1285, for instance, could write 360 as 300 & 60.²⁹ The copyist of BL MS Add.27589 is generally more careful, but again, he appears to have seen no difficulty in using Arabic and Roman numerals interchangeably, writing annus Iulii constabat ex 365 diebus et vi horis.³⁰ Moreover, numerals are often mixed with verbal forms: hoc est decies xii, id est quinquies .24. hore.³¹ Here the verbal form differentiates the multiplier, but often the choice of form appears to be quite arbitrary, varying from copyist to copyist.

The second innovation that the Algorism involved was the introduction of rules for the elementary arithmetical processes.³² These rules were not necessary for the Compotus ecclesiasticus, and that their use is not assumed in students of the treatise is evident from the fact that multiplication is performed from left to right, as with the abacus, rather than from right to left, as in algorism. The dissemination of the new arithmetical processes seems to have been slow: the fourteenth century Commentary of

²⁹Oxford MS Bodl.Ashm.1285, fol.110rb.

³⁰BL Add.27589 fol.14vb.

³¹p.217.

³²Seven in the Carmen de algorismo of Alexander de Villa Dei: addition, subtraction, doubling, halving, multiplication and the extraction of roots. Sacrobosco's Algorismus adds two more: progressio and numeratio.

Magister Conrad contains advice for "those who do not know Algorism".³³ Mathematical competence was possibly not very high even amongst Grosseteste's students: he provides a run-down for them of the bissextile years and how to recognise them.³⁴

Algorism did not cover fractions, but base 10, implicit in the abacus, became explicit after its introduction, and base 60 much easier to handle. Arabic numbers fly off into infinity, and we are so used to this that calculating in Roman duodecimal fractions, which is fundamental to an understanding of the Compotus ecclesiasticus, seems strange to us.³⁵ But Roman fractions, numbers viewed as parts of a whole, are more concrete, and therefore easier for the unmathematical to hold in the head. Moreover, they were compatible with the earlier 84-year Roman cycle, which divided conveniently by twelve; as we shall see, they were more durable than Jones thought;³⁶ and even when they were not used, the principle of working backwards from a whole number seems to have influenced the value given to the atom.³⁷

³³Vienna MS 3816, fol. 84rb: illis qui nesciunt algorismi

³⁴Compotus correctorius p.218.

³⁵Although less so to those of us who were brought up with fsd and linear feet and inches.

³⁶C.W.Jones, Bedae opera de temporibus p.334: "with the introduction of the 19-year cycle and the 24-hour day, duodecimal fractions lost some of their value"

³⁷See below, pp.386-387.

In turning to the Computus ecclesiasticus, since its methods predate the Algorism, we should refer perhaps to the specific problems of reckoning, rather than of arithmetic; although it was with the aid of arithmetic that they would eventually be solved. These are problems that are inherent either in the ecclesiastical calendar, or in the computistical tradition.

The problems that are inherent in the ecclesiastical calendar are the determination of the length of the tropical year, and the correlation of the solar and lunar cycles. Despite the God-given mandate that placed the sun and the moon in the heavens "to be for signs, and for seasons, and for days, and years"(Gen.1,14), this correlation cannot be made in whole numbers. The tropical year is not completed in 365 days; 12 solar months do not equal 12 lunar months; even with the bissextile, the nineteen-year solar cycle of 6939.25 days is not equal to the 19-year lunar cycle of 6940.25 days. To rectify the situation, the computist has to introduce the leap day, the embolism, and the saltus lune. All of these present problems with reckoning, as the writer of the Computus ecclesiasticus is aware.

The problem that was inherent in the computistical tradition involved the Dionysian Cycle, which established the Christian era. In the Computus ecclesiasticus, the solution of the problem is connected with the eleventh century computist Gerland, although, as we shall see, his

was not the first attempt at rectification.³⁸ But it was not a real problem, for, as our computist says, you can start a circle wherever you like;³⁹ and it was not something that was dealt with by the Gregorian Reform. Indeed, by the time that the Computus ecclesiasticus was written, interest in the subject appears to be subsiding.

3. Technique.

There had always been a "high road" and a "low road" to the acquisition of computistical expertise. The profound and scholarly work of Bede is an example of the former. Many students appear to have used the "low road", which provided practical answers to particular calendar problems in the form of argumenta, mnemonic verses and the computus manualis.

Argumenta.

Cordoliani defined Argumenta as "a series of practical procedures for finding the date of Easter and the other mobile feasts".⁴⁰ In fact, the argumenta he records (none

³⁸Nor the last: for a modern attempt see C.J.Humphreys and W.G.Waddington, "Dating the Crucifixion", Nature, 306 (22/29 Dec. 1983), 743-746.

³⁹p.222: in circuli contingit sumere principium ubicunq;e volueris.

⁴⁰A.Cordoliani, "Contribution à la littérature du comput ecclésiastique au moyen âge" Studi medievali, ser.3,1 (1961), 173.

of which occur in the Computus ecclesiasticus) apply also to the solar cycle. Jones tells us that many short computistical tracts were composed in "the fury of creation following the introduction of the study of the computus into the schools".⁴¹ Many can be traced to the collections that go under the name of Dionysius.⁴² Collections of argumenta are to be found in the anonymous Liber de computo and De argumentis lunae libellus⁴³ and in many other places. Often these "assembled computi" contain "many different formulae for solving the same problems".⁴⁴

We may assume that the writer of the Computus ecclesiasticus had access to this kind of material, which, as Cordoliani observes, appears in numerous MSS from the eighth to the fourteenth centuries. He may equally well have found it in earlier treatises, in particular Helperic: the elaborate argumenta for the bissextile and the saltus lune are both to be found in the latter's Liber de computo.⁴⁵ Other argumenta occur throughout the text. They are introduced by the formula Si vis scire or its equivalent.

⁴¹C.W.Jones, Bedae pseudepigrapa p.33.

⁴²Dionysius Exiguus Argumenta Paschalia PL 67, 785-8.

⁴³PL 129, 1273-1372; PL 90, 710-728.

⁴⁴Bedae Pseudepigrapa p.55.

⁴⁵Helpericus, Liber de computo, PL 13, 21D-23A; 32D-33D.

Mnenomics.

Two Latin authors, Ovid and Ausonius (310-c.393 A.D.), composed poems in which calendar material figures prominently. Descriptive verses associating month and constellation are often to be found in calendars.⁴⁶ The author of the Compotus ecclesiasticus makes good use of Ovid's Fasti; but he also includes versus which belong to an entirely different tradition, that of the Carolingian schools. Because books were short, "mnenomics were assiduously cultivated".⁴⁷ Their occurrence in many schools treatises, including the Compotus correctorius of Robert Grosseteste, would suggest that the students in the universities found them just as useful as their predecessors in the cathedral schools.

The mnenomics that occur in the Compotus ecclesiasticus come in two kinds: those that make sense, and those that don't. The former contain straightforward information that the student needs to memorize: the names of the planets, for instance, or the fact that in a leap-year, St Matthew's Day is celebrated on the second of the two days which are entitled vi kal. Martis. The latter are a kind of shorthand to assist in the recalling of information: the dates of the

⁴⁶See John Henig, "Versus de mensibus", Traditio 11 (1955), 65-90.

⁴⁷C.W.Jones, "Carolingian Aesthetics: why modular verse?", Viator 6 (1975), 336.

Egyptian Days, for example, or the number of the solar regulars. They were not intended to make sense. De sensu isti versus non est curandum, remarks a copyist about one such piece of rigmarole.⁴⁸

One of the oldest recorded computistical mnemonics is not found in the Computus ecclesiasticus. This is the verse beginning None Aprilis norunt quinos, which gives the date of the Easter full moon and the lunar regular for each year of the 19-year cycle. According to C.W.Jones it dates from before Isidore,⁴⁹ and was thought to have had an angelic origin.⁵⁰ The verse appears on its own in numerous MSS. It was incorporated into his treatise by Rabanus Maurus. It was obviously very well-known: Helperic cites only the first line, assuming that his students will be able to supply the other eighteen.⁵¹ Gerland refers to the legend about its origin, but does not include the verse.⁵²

⁴⁸Cambridge MS Pemb.278 38r.

⁴⁹C.W.Jones, Bedae Opera de Temporibus p.33: "Isidore referred to it in his Etymologies in terms that showed it was commonplace even then".

⁵⁰C.W.Jones, "A legend of St Pachomius", Speculum 18 (1943), 198-210. How the mnemonic works is clearly explained by Dáibhí O Cróinín in "Mo-Sinnu Moccu Min and the Computus of Bangor", Peritia 1 (1982), 287-8.

⁵¹PL 137, 44C: Si ergo scire vis quo Kalendarum die quilibet terminus occurrat, lectionem istam memoriter tenere debes, quae exinde versifica specie composita decantatur, ita incipiens: Nonae Aprilis norunt quinos.

⁵²Digby 56 fol.174rv: Legimus namque scribente beato cirillo alexandrie episcopo quia pachomius monachus insignis factis apostolice gratie fundatorum egiptii cenobiorum edidit ad monasticam que litteras regebat quas angelo dictatante perceperat ut errorem non incurreret in

Honorius reminds his readers of the verse.⁵³ Roger of Hereford includes the verse as well.⁵⁴

The method of finding Easter by means of the epact was superseded by the golden number. The ancient verse was thus obsolete. It appears to have been replaced by Aureus hac arte, which gives the position of the golden number in the 19-year Cycle.⁵⁵

Many of the mnemonics which occur in the Computus ecclesiasticus are to be found also in the Massa compoti of Alexander de Villa Dei, and this, together with other places in which they may be found, is indicated in the Commentary that follows the edition. It is impossible to know whether the writer of the Computus ecclesiasticus borrowed his mnemonics from Alexander, or whether they both took them from some common source; as has already been pointed out, Alexander made no claims to originality,

paschalis sollempnitatis ratione.

⁵³Honorius Augustodunensis, Imago mundi, ed. V.I.J. Flint, Archives d'Histoire Doctrinale et Littéraire du Moyen Age 49 (1982), 120: Hunc terminum per versus none Aprilis sed et ferias eius facillime reperire poteris.

⁵⁴Digby 40 fol.34r: Set quoniam incongrua erat diversitas inter quos erat catholice fidei unitas, Pachomius abbas quidam cum esset vir summe religionis rogatu multorum in dicto ieiunio domini orasse legitur, ut sibi placitum suum circa paschalem sollempnitatem manifestare dignaretur. Cui angelo revelante hos versus misisse dictus est...

⁵⁵See below, p.369ff.

despite the innovatory nature of some of his material.⁵⁶

Compotus manualis.

Alexander and the Compotus ecclesiasticus both make use of compotus manualis, that is, they explain ways in which the fingers can be used in calendar calculations. Counting on the fingers is a primitive activity. A discussion of finger-reckoning forms the first chapter of Bede's De temporum ratione. This was much copied, appearing as a separate treatise, but the material in it is older than Bede, and would appear to be Insular in origin. The Irish seem to have "exercised their mathematical genius on academic problems relating to time".⁵⁷ An example of the complicated operations that occupied them is the treatise on the saltus lune which was attributed to Alcuin by Froben, but which appears to have been known to Bede.⁵⁸ The abacus was unknown at this stage, and presumably the calculation was performed with the aid of the fingers. But the abacus did not make finger-counting obsolete: it was indeed its necessary adjunct, since using the abacus requires the temporary memorising of intermediate stages in a calculation.⁵⁹

⁵⁶See above, pp.127-128.

⁵⁷C.W.Jones, Beda's opera de temporibus p.330-1.

⁵⁸PL 101, 979-1002: De cursu et saltu lune ac bissexto.

⁵⁹ See Karl Menninger, Number Words and Number Symbols p.35, 201ff.

Finger-reckoning must have seemed peculiarly appropriate for computus, since the digits are providentially disposed for its operations: 19 places can be counted on the joints and tips of the fingers and thumb of one hand, which thus serve for the lunar cycle; 28 places on the joints and tips of seven fingers on two hands, which serve for the solar cycle.⁶⁰

Computus manualis is, literally, the application of rule-of-thumb methods to calendar calculation. It was known in Bede's time. Chapter 55 of the De temporum ratione is given over to a description of the placing of the lunar and solar cycles on the fingers.⁶¹ The method is recorded in metrical form in a well-known and much commented-upon Computus manualis attributed to a Master Anianus.⁶² Its editor assigns it to the second half of the thirteenth century, but there is little in it to suggest such a late date. Many of the verses which appear in it appear also in the Computus ecclesiasticus and in the Massa compoti.

Computus manualis is seen in an elaborate form in the Tabula fnugonis, which is the first item in the Doctrina

⁶⁰This topic was discussed in a most interesting paper by Faith Wallis, delivered at the Warburg Institute in February 1991: "The calculating hand: finger reckoning and computus texts".

⁶¹DTR pp. 275-6. The method that Bede uses for the solar cycle is different from that described above, which is that of the Computus ecclesiasticus.

⁶² Le comput manuel de Magister Anianus, ed. D.E. Smith (Paris 1928, rep. Geneva, 1977), p.30.

tabularum which concludes the Massa compoti of Alexander de Villa Dei. The Tabula fnugonis is a kind of commentary on the verses beginning

A festo stelle numerando perfice lune

It is a method of determining the number of weeks and days between Christmas Day and Easter, involving the use of three different alphabets.⁶³ Similar material appears in the Compotus of Conrad of Strasbourg.⁶⁴

Material of this kind could not have been used without some sort of explanation, which, as Bede remarked, was easier to give orally than in writing.⁶⁵ The technique of the compotus manualis was familiar enough to be included without comment in most calendar treatises. In the Compotus ecclesiasticus it occurs in connection with the bissextile, the epact and the claves, although, unlike the Massa compoti, not for the golden number.

Tables.

It is characteristic of "computistical encyclopaedias" like

⁶³The way the table works is explained by van Wijk, Le Nombre d'Or pp.126-7; the odd name is derived from the juxtaposition of the letters FNUGO in the table.

⁶⁴Bruges MS 528 fols.5v-6r.

⁶⁵DTR p.276:Sed et innumera huiusce disciplinae, sicut et caeterarum artium, melius vivae vocis alloquio quam stili signatis traduntur officio.

St John's 17 that they contain much information in graphic form. Diagrams and tables are an integral part of the De anni ratione, sometimes very beautifully executed by the copyist;⁶⁶ but they are noticeably absent from the MSS of the Computus ecclesiasticus that I have seen, except as marginalia. Reference is made to the table of concurrents, but the reference does not imply that it was ever part of the text, merely that it was something to which the student would have access.⁶⁷ Diagrams have of course to be studied at first hand, something which is easier to do in the cloister than in the lecture-hall. This absence of graphic material would appear to be one of the marks of a treatise intended for the Schools: Gillian Evans has remarked on "the comparative rarity of diagrams or tables among the algorisms".⁶⁸

Part II: Sources.

Only direct quotations from other writers, generally when they have been cited by name, have been annotated in the edition of the Computus ecclesiasticus. It is often difficult to identify material which appears to have influenced the writer, but which is not acknowledged by

⁶⁶ See, for instance, Cambridge Univ.Ii.III.3, which Thorndike, The Sphere of Sacrobosco p.63, justly describes as a "splendid parchment folio".

⁶⁷p.229: sicut patet depingenti tabulam concurrencium.

⁶⁸G.R.Evans, "From abacus to algorism", British Journal for the History of Science 10 (1977), 121.

him, and where there are only tenuous verbal parallels. Did the writer have direct access to a previous writer, or does he know him only through other writers, or through the medium of florilegia? Does similar material indicate a source, or merely a parallel?

One example of the sort of difficulty that arises is in a discussion of the date of the Crucifixion.⁶⁹ The writer tells us that the event took place on X kal. April. His source for this could be the De temporum ratione of Bede. Bede's source was a treatise well-known in Ireland: the Acta synodi of Ps-Theophilus.⁷⁰ But his account is quoted verbatim by Gerland. The writer of the Computus ecclesiasticus cites Gerland by name, and his abbreviated passage could have been from Bede or from Gerland, although the third possibility, that he had access to Bede's source, seemed unlikely, although not impossible.⁷¹ Again, one of the pleasant characteristics of the Computus ecclesiasticus is its quotation of writers who must have been familiar to its readers from their Trivium studies. The line from the De inventione of Cicero at the beginning of the treatise⁷² appears to have been a popular one. The De inventione is

⁶⁹p.273: Quidam iterum dicunt quod Dominus passus est 10 kalendas aprilis.

⁷⁰See C.W.Jones, Beda's opera de temporibus, pp.87-88.

⁷¹In fact, the evidence of the text implies that Gerland was his source: see pp.392-393.

⁷²p.191.

included in a list of textbooks which C.H.Haskins attributes to Alexander Neckam,⁷³ and Neckam himself quotes this line, in nearly the same form (which is not Cicero's), in his De naturis rerum.⁷⁴ So does Durandus, in the Rationale divinorum officiorum, although probably this author is quoting directly from the Computus ecclesiasticus.⁷⁵ Since the line does not appear in the form in which Cicero wrote it, it is possible that it originated in a collection of extracts, a florilegium, rather than from the work itself. It is impossible to know if the same is true of the other two poets that are quoted. The computist uses some lines from another popular work, the De consolatione philosophie of Boethius,⁷⁶ to round off his treatise. The work of which it is a part, with its succinct expression of Platonic sentiments, was a favourite

⁷³Sacerdos ad altare; see earlier, p.42.

⁷⁴Alexander Neckam, De naturis rerum, ed. T.Wright (Rolls Series 34, 1863), p.30: Tullius vero, attendens usitatem temporis acceptionem ab officio oratoris non esse alienam, ait, "Tempus est pars aeternitatis, cum annui, mensurni, diurnive spatii certa dimensione". Cicero, De inventione rhetorica, Lib.I, cap.26, 39: Tempus autem est - id quo nunc utimur, nam ipsum quidem generaliter definire difficile est - pars quaedam aeternitatis cum alicuius anni, menstrui, diurni, nocturnive spatii certa significatione.

⁷⁵Gulielmus Durandus, Rationale divinorum officiorum (Ulm 1475), 254v: Tempus vero prout hic sumiter est secundum Tullium quidam quantitas anni mensurni diurni seu alterius spatii. (In the "emended" Venice 1609 edition of the Rationale, 309ra, the quotation appears as follows: Tempus vero, prout hic sumitur, est secundum Tullium, quaedam quantitas anni, mensis, diei, seu alterius spatii.)

⁷⁶Boethius, De consolatione philosophiae, trans. S.J.Tester (Loeb Classical Library, Cambridge, Mass/London 1973).

with medieval commentators. Quotation from the Fasti is far more extensive, but it is worth noting that only Book 1 of Ovid's poem is used.

Yet again, some of the material in the Compotus ecclesiasticus has parallels in the works of contemporaries or near-contemporaries. It is often impossible to establish whether the writers of the Compoti which proliferate at the end of the twelfth and the beginning of the thirteenth centuries knew each others' work, or if similarities between texts are due to the common environment from which they emerged.

Any consideration of the sources of the Compotus ecclesiasticus must begin with Bede. His computistical writings, particularly the De temporum ratione, influenced the subject-matter of all later Compoti. The Compotus of Rabanus Maurus⁷⁷ is little more than an abbreviated paraphrase of the De temporum ratione. Helperic, writing for his young brother monks, acknowledges his especial debt to Bede.⁷⁸ For Sigebert of Gembloux, Bede is "a widely-read man and because of this of great authority amongst writers".⁷⁹ Gerland's work was written manifestly under the

⁷⁷ Ed. W.M.Stevens, Rabani Mogontiacensis Episcopi De computo (C.C.Cont.Med.44, Turnhout 1977).

⁷⁸Liber de computo, PL 137, 19D: qui cum in aliis, tum etiam in hoc sanctae Ecclesiae utilitati plurimum esudavit.

⁷⁹Ed. Joachim Wiesenbach, Liber decennalis, p.194: Dominus Beda, vir multe lectionis ac per hoc inter scriptores multe auctoritatis.

influence of Bede,⁸⁰ and Bede is the most cited writer in the Compotus of Constabularius, which is a treatise full of citations.

Bede is cited by name only once in the Compotus ecclesiasticus, as one of those Christian writers who prefer to call Sunday the Lord's Day.⁸¹ We may assume that our compotist would have had access to the De temporum ratione, which was one of the most widely copied of Bede's writings, but generally, although the treatise reproduces a great deal of the material which is to be found in the De temporum ratione, there is a lack of verbal parallel. Passages of parallel content are noted in the Commentary, but it will be evident that for other information - on the golden number for instance, the Dominical letter or the claves - the writer of the Compotus ecclesiasticus had to go to other sources.

Bede's material for the De temporum ratione was drawn from Scripture and from the commentaries of SS Jerome, Augustine and Gregory. He had access too to some of the Historia naturalis of Pliny, the Etymologiae and the De natura rerum of Isidore, and short extracts only from the Saturnalia of

⁸⁰Digby 56 fol.170r: Sepe volumina domini Bede de scientia computandi replicans

⁸¹p.195: Christiani autem sicut Beda, Ieronimus et alii viri religiosi primam diem septimane appellaverunt diem dominicum.

Macrobius. Much of his information came from Irish sources.⁸²

Did the writer of the Compotus ecclesiasticus quote the writers that Bede cites through Bede, or did he have direct knowledge of them? Since the material from Macrobius which appears in the Compotus ecclesiasticus is restricted to the extracts which Bede knew, it seems likely that it derives from Bede. But it is not safe to assume that our author's access to writers that Bede uses was only via the De temporum ratione. Chapter XII of Bede's treatise, De mensibus romanorum, was often drawn on by later compotists. Bede's main source was the extract from the Saturnalia referred to above, with some details from Isidore. February, we are told, is derived from Februus, which is another name for Pluto, the god of the underworld.⁸³ The Compotus ecclesiasticus has the same explanation, but adds:

vel dicitur a febre, quia tunc febricitare solebant homines⁸⁴

This explanation, which is not in Bede, appears to be a

⁸²See C.W.Jones, Beda's opera de temporibus pp.125-129; 105-113; "The lost Sirmond Manuscript of Bede's Computus", English Historical Review 52 (1937), 204-219.

⁸³DTR p.207.

⁸⁴p.200.

misreading of Isidore: non a febre, id est aegritudine⁸⁵

Material which has similarities with the De temporum ratione is to be found throughout the Compotus ecclesiasticus, but Bede's theological preoccupations are missing. Both Helperic and Rabanus, who were writing for young members of their order, omit this sort of material, which presumably would be too difficult for their readers, and the author of the Compotus ecclesiasticus follows their example.

An account of writers on compotus has been cited in a previous chapter.⁸⁶ It implies a computistical tradition descending from Bede via Helperic and Gerland. Both Helperic and Gerland, as has been said earlier, had contacts with England, but only Gerland is cited in the Compotus ecclesiasticus. Gerland cites Helperic, and verbal parallels, which will be indicated in the Commentary, would suggest that the latter was known to our writer through Gerland. The Compotus of Constabularius, which contains a wealth of citation, cites Gerland only less heavily than Bede. Helperic is mentioned on two occasions, but the only other post-Bedan computistical writer who is named is Marianus, whose emendation of the Christian Era was known in England through the Lotharingian, Bishop Robert of

⁸⁵Isidore of Seville, Etymologiarum sive originum libri XX, ed. W.M. Lindsay, Oxford 1911, rep. 1966), v, 33.

⁸⁶pp. 81ff.

Hereford.⁸⁷ It would appear that other writers in the same computistical tradition, Sigebert of Gembloux, for instance, or Hermannus Contractus, were not well-known in England.⁸⁸

Much of the material of the Compotus ecclesiasticus cannot be traced to named sources. Bede's computistical works were "required text-books everywhere in the Carolingian system of schools".⁸⁹ They attracted to themselves other material, often Irish in origin, in the form of short treatises, and the argumenta and mnemonic verses which have been discussed above. Some of this material went under the name of Alcuin, who was responsible for the transmission of Insular learning to the Carolingian schools. W.M.Stevens suggests that he brought from York "a collection, Libellus annalis, from which he taught De bissexto, De cursu et saltu lune, and Calculatio".⁹⁰ Dáithí O Cróinín has recently drawn attention to the need for a closer examination of this Irish material, which still "found favour in the Carolingian period", and which, on the evidence of the Compotus ecclesiasticus, was still considered valuable at

⁸⁷See above, p.53.

⁸⁸I have seen no codices of English provenance containing their computistical treatises, but the Compotus of Hermannus occurs in an 11c. MS, BL Arundel 356, fols.27v-37v. The catalogue gives no indication of the provenance of this codex, which includes an Ephemeris attributed to Bede, and the Compotus of Helperic.

⁸⁹C.W.Jones, Bedae Pseudepigrapha, p.1.

⁹⁰W.S.Stevens, Rabani Mogontiacensis Episcopi De computo p.173.

the close of the twelfth century.⁹¹ We may assume that our compotist had access to collections of this kind, which continued to be added to.⁹²

The Compotus ecclesiasticus, while drawing extensively on Bede and Pseudo-Bedan material, belongs to a group of texts which appear to have been written specifically for the Quadrivium, as taught in the university schools.⁹³ Attention has already been drawn to the use of quotations from Trivium texts. Some of the material in the treatise, as would be expected, originates in the twelfth century revival of learning. Honorius Augustodunensis wrote his extensive works primarily for his own order.⁹⁴ In the Imago mundi⁹⁵ he dealt in a general way with calendar subjects, and there are striking parallels between this text and the Compotus ecclesiasticus. Moreover, the writer of the Compotus ecclesiasticus appears to have known other works

⁹¹See De ratione conputandi, ed. Dáithí O Cróinín, (Studies and Texts 86, Pont. Inst. Med. St. 1988), 102. In "An early medieval licensing examination", History of Education Quarterly 3 (1963), 23, C.W.Jones mentions the citation during "an oral examination administered in the empire of Charles the Great in A.D.809" of "Augustine" and "Jerome" from an anonymous Irish tract.

⁹²Many of the mnemonics recorded by Cordoliani, for instance, do not appear in MSS before the twelfth and thirteenth centuries.

⁹³See above, pp.33ff.

⁹⁴V.I.J.Flint, "The place and purpose of the works of Honorius Augustodunensis", Revue Bénédictine 87 (1977), 97-127.

⁹⁵Honorius Augustodunensis, De imagine mundi, ed. V.I.J.Flint, Archives d'histoire doctrinale et littéraire du Moyen Age, 49 (1982).

by Honorius. Like Helperic and Gerland, Honorius was a writer who had contacts with England.⁹⁶

Honorius was drawn on heavily by John Beleth, and it is interesting that the latter writer, whose name is not generally to be found in Compoti, is cited by the writer of the Compotus ecclesiasticus.⁹⁷ John Beleth's De ecclesiasticis officiis, a pleasant manual for priests, was used by Durandus in his Rationale divinarum officiorum.⁹⁸ It contains nothing on compotus, and for this, Durandus appears to have turned, amongst other works, to the Compotus ecclesiasticus.

Honorius and John Beleth were both writers of unimpeachable orthodoxy. But another newer sort of influence is to be found in the Compotus ecclesiasticus, of a kind which was beginning to be felt particularly in England. Reference has already been made to scientific innovation in the Compotus ecclesiasticus. The new science appears to be represented by only three citations, and these are to "the Arabs", rather than to specific authors; but it will be argued that Arabic scientific ideas lie behind the innovatory calculation for the tropical year that will be

⁹⁶See V.I.J.Flint, "De imagine mundi", 7-8.

⁹⁷p.233: Si autem scire velis quare in vigiliis aliorum apostolorum non ieiunamus, in Summa magistri Johannis Beleth plenius invenitur.

⁹⁸See above, p.17.

examined below.⁹⁹

It should be emphasised that there is no trace of the "new Aristotle" in the treatise. The Physica and Metaphysica of Aristotle were introduced into the Arts curriculum in the thirteenth century, and the Aristotelian theory of causality, efficiens, materialis, formalis and finalis, was applied to Schools texts as part of the accessus apparatus. The commentary of Master Conrad is an example of the brutal thoroughness with which this could be done. But aspects of Aristotle's theory were known earlier, from the Topica of Cicero.¹⁰⁰ It is these aspects which appear in the Computus ecclesiasticus, the causa materialis in all MSS, the causa efficiens only in one MS.¹⁰¹

⁹⁹See pp.313ff.

¹⁰⁰A.J.Minnis, The Medieval Theory of Authorship: Scholastic literary attitudes in the later Middle Ages (London 1988), p.28.

¹⁰¹p.190: Tempus enim est materia; Bodl.679 fol 65r: nam posita causa efficiente et immediata.

Chapter V.

The Manuscripts.

1. Manuscripts collated in this edition:

Ba: London, British Library MS Add. 27589.

English. Vellum. XIIIc. Small folio. Clear bookhand with red headings and alternate red and blue decorated capitals.

fol.1r [John of Sacrobosco] Tractatus de sphaera (ed. Lynn Thorndike, The Sphere of Sacrobosco and its Commentators (Chicago/London 1949).

fol.13r Computus ecclesiasticus (attributed by the cataloguer to John of Sacrobosco).

fol.28r [John of Sacrobosco] Algorismus (ed. J.O.Halliwel-Phillips, Rara Arithmetica (London 1839).

fol.35r Liber anathomie que dicitur Aristotelis (Thorndike and Kibre 862 cite BL MS Sloane 59, fol.36-98, which was edited in 1902 by R.V.Topley, and incorrectly ascribed by him to Richardus Anglicus).

fol.69r [Robert Grosseteste], Tractatus de sphaera (ed. Ludwig Baur, Robert Grosseteste, Die philosophischen Werke, Beiträge zur Geschichte der Philosophie des Mittelalters (Berlin 1912).

fol.77r Robert Grosseteste, Computus

correctorius, with the title, Compotus venerabilis patris domini et sancti Roberti Grossi capitis Lincolniensi episcopi, factus ad correctionem communis Kalendarii nostri (printed by R.R.Steele, Opera hactenus inedita fratris Rogeri 6 (Oxford 1926), 212-267. Steele, p.xxiv, describes it as "a carefully written and corrected text which seems to have been written in the middle of the thirteenth century". The ascription here has an important bearing on Grosseteste's supposed authorship of the Compotus ecclesiasticus: see p.112-113).

fol.101 Calendar, with festivals, etc. Imperfect, November and December missing.

28 March Intravit rex [Henry III] primo ecclesiam sancte Frideswide Oxonie; 14 May Bellum apud Lewes anno domini Mcclxiiii.¹

The Compotus contained in fols. 13r-27v is anonymous. It begins: Compotus est scientia considerans tempora distincta, and ends: Qui tempus ab evo ire iubes. Explicit compotus. It has no diagrams and, although it is carefully written in double columns, contains inaccuracies. There is a mixture of Roman and Arabic numerals. The treatise is divided into 15 chapters, usually marked by headings in rubric. Where the rubric is missing, the heading has been inserted in the margin, in the copyist's own hand. The usual number of chapters in the treatise appears to be 15:

¹Catalogue of Additions to MSS in the British Museum in the years 1864-1875 II, ed. E.A.Bond, 334.

this copyist has added two, fol. 22ra De anno communi, mistakingly headed De anno embolismi, and De anno embolismi, and omitted De regularis mensis. Fol.20ra has the marginal comment 44, which appears to be related to scilicet 44 in Dublin, Trinity 441, fol.107v (see below p.189).

cc Oxford MS Corpus Christi College 293b.

Parchment. Originally part of MS Corpus Christi College 293. This was composed of 9 different codices from xiii-xv century. According to a note in T.H.Aston's hand in the copy of the printed catalogue which is kept with the Archives of Corpus Christi College, it was divided into two volumes in 1910. This codex begins, therefore, at what in the old volume was fol.128. It exhibits three different foliation systems: 1. Coxe's foliation, as above, which I have used throughout this edition, since it is the most accessible; 2.foliation beginning at fol.1, presumably post-1910; 3.a further pencilled numeration on the folios. A further problem is the loss of probably one folio between fols.329 and 330, that went unnoticed by any of the foliators.²

fol.128r [S.Augustine], Libellus de anima et spiritu et de singulis proprietatibus atque differentiis.

²I am most grateful to Ms C.Butler, Corpus Christi College Archivist, for her help in disentangling this.

fol.141v Ordo dierum, quibus duae massae canuntur, aliaque ad officia ecclesiastica spectantia.

fol.142v Versus, qualiter comparandus sit mundus ludo de scaccariis (in French).

fol.144r Peter Lombard, Sententiarum libri quatuor abbreviati, cum prooemio (Magistri Petri Lombardi, Parisiensis Episcopi, Sententiae in IV Libris Distinctae (Spicilegium Bonaventurarum V, Rome 1981).

fol.195r Quaedam contra superbiam et de fide, etc.

fol.197r Nicholas of Cornwall, In Porphyrii Isagoqen commentum (see P.O.Lewry, "Oxford Logic 1250-1275: Nicholas and Peter of Cornwall on past and future realities", The Rise of British Logic, ed. P.O.Lewry (Pont.Inst.Med.Stud., Toronto 1985).

fol.207r Commentarii super Johanniti in Galeni Teqni, sive artem parvam, Isagoqen, expositi per M.B (see Thorndike and Kibre 1342, citing (inter alia) this MS: Bartholemaeus (de Brugis?), Comm. in Isagoqas Johanniti).

fols.235r De commixtionibus et complexionibus, de membris, de virtutibus et operationibus, de colore, de visu, de crisi, aliaque ex Johannitio, Constantino Africano, aliisque confecta.

fol.253r Commentarii alii in Johanniti Isagoqen ad Galeni artem parvam; cum praefatione (Thorndike and Kibre 984: "mutilated").

fol.268r Liber in varias propositiones distinctus in quo agitur, De S. Trinitate, de creatione mundi, de peccato originali, de incarnatione Verbi, de gratia et de

sacramentis.

fol.310r John of [Sacro]Bosco, Tractatus de spera.³

fol.322r [John of Sacrobosco,] Algorismus⁴

fol.326r Computus ecclesiasticus (Attributed "perhaps" to John of Sacrobosco by the cataloguer).

fol.334v Kalendarium, monostichis haud insolitis instructum.⁵

Fols. 337r-357v appear to represent two further unrelated codices.

The Computus contained in fols. 326r-334r, despite Coxe's rather despairing attribution, is the Computus ecclesiasticus. Thorndike and Kibre cite only this MS as having the incipit Computus est scientia considerans tempora distincta. It is written in two columns per page, with 39 lines to the column, in the same clear bookhand as the preceding Algorism of John of Sacrobosco and the Calendar that follows it; but Sacrobosco's Sphere was copied in a different hand. As noted above, one folio appears to be missing. On fol.377v, in a later hand: sol a puella manet reditum sex signa; fol.329r, in the right hand margin, a table of concurrents; at the bottom of the page, circular diagram giving Dionysius's and Gerland's reckoning

³For edition, see above, BL Add.27589 fol.1r.

⁴For edition, see above, BL Add.27589 fol.28r.

⁵H.O.Coxe, Catalogus Codicum MSS qui in Collegiis Aulisque hodie adservantur II (Oxford 1852), 128-9.

of the concurrents.

A Oxford MS Bodley Ashmole 1285.

A very thick volume in small quarto or wide octavo, containing 379 leaves of vellum, and formed by the collection of fourteen books or tracts written at various times and by various hands, in the thirteenth century or earlier. They were bound together in the time of Edward I in boards covered with red leather.

fol.1v Liber quondam fratris Hugonis de Wendovere.

fol.116v Liber sancte Marie de Suwerke (the conventual church of S. Mary Overy, Southwark, of which Hugh of Wendover was a member).

Only Books V and VI (fols. 90r-117v) are described here. Books I-IV are made up mainly of theological treatises and hymns; Books VII-XIV are mainly medical and theological treatises.

fol.90ra [Alexander de Villa Dei] De algorism
carmen, (ed. R.R.Steele, The Earliest Arithmetics in English EETS 1921 pp. 73-83. According to the cataloguer, the beginning is missing).

fol.91va Quaestio arithmetica, cum solutione.

fol.91vb Tractatus de temporis divisione, de duodecim signis, et de festis ecclesiasticis, cum versibus variis ad

ea melius cognoscenda (inc. per veterem sagacitatem qui mira subtilitate. Thorndike and Kibre, 1033 cite this as John of Garland, Alium compotum metricum. I examined a treatise with this incipit, Cambridge Univ. Gg.4.29 fol.86. It appeared to be a collection of calendar notes and mnemonics).

fol.93vb [Alexander de Villa Dei] Massa compoti (one of the texts used by W.E.van Wijk in his edition of this work; see Le Nombre d'Or: Etude de Chronologie Technique The Hague 1936, p.48).

fol.98rab [Alexander de Villa Dei] Carmen de algorismo (fragment).

fol.98rb Tabule ad inveniendam festa mobilia, et quot hebdomada sunt inter ea; cum regulis.

fol.100ra Cyclus paschalis, tabula rotunda.

fol.100rb Verses containing directions for Liturgy.

fol.101ra [John of Sacrobosco], Tractatus de spera.⁶

fol.107ra Compotus ecclesiasticus (described by the cataloguer as Johannis de Sacrobosco liber de computatione temporis).

fol.117v De metrici iambico, inc. Dicit Priscianus quod in hoc metro Oracii. (Written in long lines in a later hand on the reverse of the twelfth leaf of this part.⁷

⁶For edition, see above, BL Add.27589 fol.1

⁷W.H.Black, A Descriptive, Analytical and Critical Catalogue of MSS bequeathed unto the University of Oxford by Elias Ashmole. (Oxford 1845), col. 1044-1050.

Among the bibliographical references to this codex are: Scriptorium 16 (1969) no. 589; G.L.Bursill-Hall, Census of medieval Latin Grammatical MSS (Grammatica speculativa, ed. J. Pinborg 1981); Traditio 34 (1978), 444; 32 (1976) 272; Bodleian Library Record IV (1953), 170; Revue Bénédictine 46 (1934), 296; 306. None of these, however, refer to Books V and VI described above.

The version of the Computus ecclesiasticus is contained in what appears to be a collection of liberal arts texts which make up Books V and VI of this codex. It has the usual incipit, Computus est scientia considerans tempora distincta secundum motum solis et lune, but a longer explicit than the other texts I have examined: unde Boetius, Qui tempus ab evo ire iubet stabilique manens dans omnia moveri. At the top of fol.107 the following appears:

Quingento decies, cum bis centum minus uno
Annos dic ab Adam donec verbum caro factum.

At the foot of the second column of fol.116v there is what the copyist calls an augurium (riddle):

mitto tibi frontem veneris zonemque diane
atque capud haris cum pede leucotie.

Letters written over the lines make it clear that this spells out vale. The text is written in a cramped hand in

two columns of usually 34 lines each. The foliator overlooked one verso and one recto between 15r and 16r: I identify these as 15+r and 15+v. The treatise is divided into sections, but the breaks between sections are marked only by the beginning of a new line: there are no chapter numbers or headings. The text contains arithmetical inaccuracies.

U Oxford MS University College 26.

English. Parchment, small quarto. 150 fols. XVc. In the hand of John Hatfeld, whose name appears on fols. 25v, 90r and 121v. Hatfeld supplicated for the degree of B.D. on 11 November 1454. It was before this, presumably, that he copied the Quadrivium texts to be found in this codex. He was recorded by A.B.Emden as a monk of St Alban's Abbey and Scholar of Gloucester College, Oxford, who was still in residence in 1456. He later became Prior of Belvoir, Leicestershire.⁸

fol.4r [Johannis de Sacrobosco], Algorismus.⁹

fol. 26r-90r Computus ecclesiasticus (described by the cataloguer as being either by John of Sacrobosco or by Robert Grosseteste. The treatise finishes, fol.90r: Explicit liber qui vocatur Computus quod Hatfeld.

⁸C.W.Boase, Register of the University of Oxford (O.H.S.I, 1884); A.B.Emden, A Biographical Register of the University of Oxford II (Oxford 1958), 885.

⁹For edition, see above, BL Add.27589 fol.28.

fol.90v Calendar verses, repeated from preceding treatise.

fol.91v (originally blank; in later hand) Gul Roger. ex hospiti Lincoln 1669.

fol.92r Note on astronomy, perhaps in Hatfeld's hand.

fol.92r [John of Sacrobosco] liber de spera.¹⁰

fol.122r Theorica planetarum, cum figuris (attributed by the cataloguer to Robert Grosseteste; but the latter is unlikely to have been the author of this very popular work: see Olaf Pedersen, "The origins of the Theorica planetarum", Journal for the History of Astronomy 12 (1981), 113-123.

fol.143r De vocibus animalium (Thorndike and Kibre 1706 cite only this MS).

fol.146r Thomas Bradwardine, Tractatus de proportione (ed. H.I.Crosby, 1955).

The Computus contained in fol.26r-90r is unascribed, and is written in a large sprawling hand which takes up far more space than the earlier copyists allowed themselves. There are many doodles, leaves, and hominoid forms predominating. The opening C of the incipit is illuminated. The treatise is divided into 21 chapters marked with Arabic numerals at the top of the folios and in the margin. The text contains a mixture of Roman and Arabic numerals, and is reasonably accurate. It shares the same MS

¹⁰For edition, see above, BL Add.27589 fol.1

tradition as Oxford MS Bodl. Ashmole 1285 described above and the printed version of the De anni ratione of John of Sacrobosco.¹¹

C Oxford MS Bodley Can. Misc. 71.

Spanish. Parchment, small quarto, XIV and XIII. The last part, which includes the Computus ecclesiasticus, is written in two columns. On fol.59r, a drawing of S.Katherine, and at the bottom of the folio, 1375 mensis februarii die decimo septimo fuit locus placabilis et duravit per dies octo; Ego Marchus de ... dolo de Venetiis de confratribus Sancti Geminiani; Questo libero sie de ... pre ... Beneto da Sancte. onal preve de la grecia.

fol.1r De arte grammatica, with title added by later hand, Scala sapientis per grammaticam (imperfect).

fol.5 Petri de Bernia, Computus de arte astronomie.¹²

fol.14v De ponderibus, (partly in verse).

fol.15r Tables to find Easter.

fol.17r [?John of Sacrobosco] Libellus de Algorismo (this appears to be a fragment, the cataloguer says "perhaps from Alexander de Villa Dei. The incipit he gives: Ars ista, que ab inventore dicitur Algorismus, might

¹¹H.O.Coxe, Catalogus Codicum MSS qui in Collegiis Aulisque Oxoniensibus Hodie adservantur I (Oxford 1852), 7.

¹²See above, p.37.

suggest the Algorismus of John of Sacrobosco.¹³⁾

fol.18v Versus totidem de lapidibus pretiosis.

fol.21r Kalendarium, cum monostichis.

fol.27r De algorismo libellus (the cataloguer suggests a comparison with the Algorismus of John of Sacrobosco).

fol.31v Compotus ecclesiasticus (catalogued simply as Tractatus de computo).

fol.41r Tractatus astronomicus de Zodiaci signis, cum tabulis.

fol.46r Prognostica secundum planetam sive signum, sub quo aliquis natus fuerit.

fol.47r [Alexander de Villa Dei], Massa compoti.¹⁴

fol.55r [Alexander de Villa Dei] De algorismo carmen.¹⁵

fol.59r Commenta in Evangelium historiam, praecipue Domini nostri Jesu Christi adventum, in compendium redacta.¹⁶

This MS is included in the list of MSS of the treatise on the Compotus attributed to John of Sacrobosco kindly sent

¹³For edition, see above, BL Add.27589 fol.28r.

¹⁴For edition, see above, Bodl.Ashmole 1285 fol. 93vb.

¹⁵For edition, see above, notes to Bodl.Ashmole 1285 fol.90ra.

¹⁶H.O.Coxe, Catalogi codicum manuseriptorum bibliothecae Bodleianae pars tertia (Oxford 1854), col.477-479. This MS belonged formerly to Matteo Luigi Canonici, S.J., (1727-1807) F.Madan, A Summary Catalogue of the MSS in the Bodleian Library at Oxford IV (Oxford 1897), 313 describes the Canonici collection of MSS as "the largest single purchase ever made by the library".

to me by W.M.Stevens.

The Compotus contained in fols.31v-40 has the usual incipit and explicit. Each page has 2 columns of 36 lines each. There are no chapter headings, and large ornamental capitals which at first sight appear to indicate the beginnings of new sections seem in fact to have been used quite arbitrarily. There are no marginal comments, although the margin has been utilised in places to supply text omitted by mistake. There is a mixture of Arabic and Roman numerals. There are some numerical inaccuracies, and odd spellings of words that appear to have been unfamiliar to the copyist. This version of the treatise shares the MS tradition of Bodl.679 below.

B Oxford MS Bodley 679.

Parchment. 5x3/8in., 11+141 leaves with illuminated capitals etc.English. F.Madan and H.E.Craster, A Summary Catalogue of Western MSS in the Bodleian Library II part I (Oxford 1922), 443, suggested that the codex was written late in the thirteenth century. Madan was later to assign it unhesitatingly to the fourteenth century.¹⁷

This codex, which is well-documented in secondary sources, belonged to St Augustine's, Abbey, Canterbury. The list of

¹⁷See p.92.

contents on fol iiv and the rubricated titles of each article were made by Clemens Cantyrbury Monachus: see fols. iiv, 19, 97, 127, 138. He also wrote that the volume was de librario monasterii sancti Augustini Cantuarie and placed the abbey arms between S and A above on fol 1v, cf fol.66v. But the volume is not in the Catalogue of the Abbey library, which is now in the possession of Trinity College, Dublin.¹⁸ He wrote on the same folio: Collectionis Johannis de London. After the Reformation, it passed to John Twyne.¹⁹

fol.1r Gundisalvus [Gundissalinus], De divisione philosophie.

fol.20r [Hermes Trismegistus] Tractatus de alkemia.

fol.35r Tractatus qui intitulator [Prometheus de] concordancia iuris.

fol.51v [John of Sacrobosco] Tractatus de algorismo.²⁰

fol.56v [John of Sacrobosco], Tractatus de Spera (a later hand has added over the beginning of the work Jo de Sacrobosco).²¹

fol.65r Compotus ecclesiasticus (ascribed here to "Master Robert Grosseteste").²²

¹⁸Dublin, Trinity MS 360.

¹⁹See p.93.

²⁰For edition, see above, notes on BL Add.27589 fol.28.

²¹For edition, see above, notes to BL Add.27589 fol.1.

²²See pp.90ff.

fol.75v Tabula funqonis (a method of establishing the number of weeks and days between Christmas and Easter)²³

Fol.76rv blank.

fol.77r William of Conches, Philosophia (Printed in Migne, PL 172, 41-102, under the name of Honorius Augustodunensis. See A.Vernet, "Un remaniement de la Philosophia de Guillaume de Conches, Scriptorium 1, 1946-7, 253, where this MS is cited).

fol.97v Tractatus de complexionibus.

fol.107rv blank.

fol.108r Adelard of Bath, Questiones naturales (ed. Müller, Beiträge 31, 2, 1934).

fol.127v Liber qui intitulator Ymao mundi (not, apparently, the Imago mundi of Honorius Augustodunensis. Thorndike and Kibre attribute a treatise with this incipit, Septiformispiritu to Henry of Huntingdon, without, however, citing this MS).

The Compotus contained in fols. 65r-75r begins Multiplex est annus scilicet solaris and ends Unde Boethius qui tempus ab evo. Ire iubes. Explicit compotus magistri Roberti Grosseteste. This explicit is in the same hand as the rest of the treatise, although the heading on fol. 65r, Hic incipit compotus magistri Roberti Grosseteste, the heading Compotus R.G. which spreads across the verso and recto of folios 65v-70r, and the repeated Explicit compotus magistri Roberti Grosseteste on fol.75r appear to be in the

²³See pp.149-50.

hand of Clement (see above). There are 15 chapters, each marked, e.g., Cap 1 De duplici anno (only this MS gives a title to the first section), and marginalia in the same hand. Chapter numbers are Arabic, but throughout the text Roman numerals are used. The text is not easy to read, since it is written in a small hand with 40 or more lines to the page. The text is carefully copied, with what would appear to be the copyist's own comments incorporated. It shares the MS tradition of Can. Misc.71 above.

With Dublin, Trinity MS 441, the version of the treatise in this MS has been the subject of some critical attention. It was listed by S.H.Thomson in The Writings of Robert Grosseteste (Cambridge, Mass. 1940), pp.94-95; and discussed by James McEvoy, "The chronology of Robert Grossteste's writings on nature and natural philosophy", Speculum 58 (1983), 618-20 and R.W.Southern Robert Grosseteste, Scholar and Bishop (Oxford 1986), pp.127-131. Professor R.C.Dales, with whom I had the opportunity of discussing this MS and the related Dublin, Trinity MS 441 in 1987, disputed my conclusion that Grosseteste was not the author of the versions of the treatise to be found in these MSS in "The computistical works ascribed to Robert Grosseteste", Isis 80 (1989) 74-79. Professor McEvoy's revised views are expressed in Bulletin de Théologie Ancienne et Médiévale (1987), 356.²⁴

²⁴ For my discussion of this ascription, and the improbability of Grosseteste's authorship of the Computus ecclesiasticus, see pp.90ff.

2. Manuscripts referred to, but not collated in this edition:

Cambridge MS Pembroke 278.

Vellum, 6 2/5 x 4 1/2, 119 fols, 28 lines to a page. Early XIVc. A good hand of charter type.

fol.1r Robert Grosseteste, Compotus correctorius (ascribed).²⁵

fol.25r Compotus ecclesiasticus (catalogued simply as Compotus).

fol.61v [John of Sacrobosco] Tractatus de spera.²⁶

fol.69v Alius compotus

fol.88r blank.

fol.88v Profatius Judeus, Quadrans novus secundum correctionem Petri de S. Audomaro (for the Quadrans novus, see Olaf Pedersen, "The Corpus astronomicum and the traditions of late medieval astronomy", Studia Copernicana 3, 1973, 78: "the Latin version of a treatise on the quadrans novus invented by Profatius Judaeus (Hacob ben Mahir) of Marseilles and described for the first time in a Hebrew text dating from about AD 1288").

²⁵For edition, see above, notes on BL Add.27589 fol.77r.

²⁶For edition, see above, notes on BL Add. 27589 fol.1.

fol.117r (15th century) De radicum extractione.²⁷

The Computus contained in 25r-69v begins Computus est scientia considerans tempora distincta. There is a different ordering of sections, and much additional material, including comment on the Egyptian Days (fol.29v), the names for the days of the week amongst the gens Germanie(fol.27r), and an implied date, 1240 (fol.35v).²⁸ The treatise is carefully written, but there is an apparently arbitrary marking of sections, sometimes with rubrics, sometimes with marginal headings. There are no numbered chapters. It is difficult to see where the treatise ends, since there is an accretion of computistical material, verses and tables.

Dublin, Trinity MS 441 (D.4.27).

English 14th century (1st half). Red or blue initials; some capitals marked with red. Parchment. 271 folios.

fol.1r List of contents (in different later hand).

fol.1v originally blank.

fol.2r Boethius, Arithmetica (ed. Michael Masi,

²⁷M.R.James, A Descriptive Catalogue of the Manuscripts in the Library of Pembroke College, Cambridge (Cambridge 1905), 253-4.

²⁸Pemb.278 fol.35v: Unde in 1200 annis retrocessa sunt solsticia et equinoctia per 10 dies, et in 40 annis dimidium diem, licet de eo non sit curandum quosque venerit ad integrum diem.

Boetian Number Theory, Studies in Classical Antiquity
6, Amsterdam 1963.

fol.45r Gerbertus, In Boethii Arithmetica (excerpt.
ed. N.Bubnov in Gerbert, Opera mathematica, Berlin 1899).

fol.46r Boethius, De Trinitate (ed. H.F.Stewart and
E.K.Rand, Cambridge Mass. and London 1953, 2-30).

fol.49v Boethius, De predicatione trium personarum
(ed. Stewart and Rand, 32-36).

fol.50r Boethius, De persona et naturis Christi contra
Nestorum et Eutychem.

fol.58v Boethius De hebdomadibus (ed. Stewart and
Rand, 38-50).

fol.60r Ptolemaeus, Centiloqium, trans. Johannes
Hispalensis (unfinished; originally blank: added mid 15c).

fol.64r Ars precisa et perpetua ad capiendam
coniunctiones. Refeccionis divini pabuli dispensatori
facundissimo magister W. Wygorn. episcopo salutem atque
celestis assensionis gradum demum pertinere celsiorem.
With calendar tables. On fol.67v, calculations for the
years 1292-2337; on fol.68v Astronomical calculation for
1317.

fol.69r [Robert Grosseteste], Tractatus De spere.²⁹

fol.75r Short pieces, mainly astronomical and
arithmetical.

²⁹For edition, see above, in notes on BL Add.27589 fol.
69r.

- fol.77v Robert Grosseteste, Compotus correctorius.³⁰
- fol.99r Calendar tables.
- fol.99v [John of Sacrobosco] Algorismus (catalogued as a Commentary on Algorismus of Alexander de Villa Dei).
- fol.104v Compotus ecclesiasticus (abbreviated).
- fol.111v Albategni, Tabula multiplicationis minuciarum.
- fol.111v Note about Pyrric metre.
- fol.112r Thebit, De hiis que indigent expositione antequam legatur Almagestum.
- fol.115 Theodosius, De habitationibus, trans. Gerard of Cremona.
- fol.118v Short pieces (verses, problems, mainly mathematical).
- fol.120r Theorica planetarum.³¹
- fol.128r Short pieces, verses and astronomical tables.
- fol.212v Commentary on the Centiloquium of Ptolemaeus.³²
- fol.227r [Robert Grosseteste], De novem cometis (Ludwig Baur, Robert Grosseteste, Die philosophischen Werke pp.36-40; see S.H.Thomson, The Writings of Robert Grosseteste, p.112.

³⁰For edition, see above, in notes to BL Add. 27589 fol.77r.

³¹see notes to Univ.26, fol.122r.

³²See note to Trin.441 fol.60r.

fol.228r Profatius Judeus, Quadrans novus.³³
fol.228v Astronomical diagrams.
fol.229r Tables.
fol.232v 2 treatises about chiromancy.
fol.235v Daniel De somniis.
fol.238v Hermes: predictions by thunder.
fol.239v Albertus Magnus, Physionomia.
fol.240v Short pieces about weather, medicine,
mathematics and chiromancy.
fol.271r Diagram of hand for chiromancy, added in
15c.³⁴

This MS has the name W. Dussyng in red on fols. 1, 2 and 3. The name appears in the same hand in black at the bottom of the first folio. The MS belonged to John Dee, and has his signature (Io Dee 1553 Jan 18) on fol.2r. It is listed in his catalogue of his Mortlake Library.³⁵ A possible connection between this MS and Bodl.679 is discussed earlier.³⁶ Like the latter MS, it has been the subject of

³³See note to Pemb.278 fol.88v.

³⁴M.L.Colker, Trinity College Dublin: A Descriptive Catalogue of the Medieval and Renaissance MSS II (London, Scolar Press 1991), 871-883

³⁵ ed. J.Halliwel, The Private Diary of Dr John Dee, and the Catalogue of his Library of MSS (Camden Society 19, 1842, p. 80, no. 137. See M.R.James, "lists of MSS formerly owned by Dr John Dee", Bibliographical Society Supplement 1 (1927). Unaccountably, W. O'Sullivan, "Ussher as a collector of Manuscripts", Hermathena 88 (1956), 34-38, does not mention Trin. MS 441.

³⁶See above, p.93.

some critical attention.³⁷

The Compotus contained in fol.104v-111r begins Que vel dimissa est in alio tractatu compoti vel minus lucide vel aliter dicta quam ibi hic reperi posset. It ends Unde Boecius qui tempus ab evo ire iubet. Explicit. Despite the attribution in the list of contents, it is unascribed by the copyist. There are no chapter headings, but the chapter divisions are noted in the margin with Arabic numerals and capital letters, thus: .1.C. Arabic numerals are used throughout the treatise, except twice, in fol.106v: duodecies X hore, and in fol.107v: per X dies recessit iam solsticium. There are the following marginal comments: scilicet 44 (107v, amplifying et eo amplius)³⁸; Nota etiam quod iste dicit in hoc capitulo quod 30 dies et dimidius est decimam pars anni. There are no diagrams.

3. Other Manuscripts.

Bruges MS 524.

Parchment, 14c., 210x140mm., 74 fols.

fol.1ra John of Sacrobosco, Tractatus de spera, preceded by Commentary of Henry of Sinrenberg (1346).

fol.35rb Tables.

³⁷See above, pp.90ff.

³⁸ See above, pp.109-110.

fol.37ra Compotus prosaicus

fol.42vb John of Sacrobosco, Algorismus.³⁹

fol.42va Alexander de Villa Dei, Carmen de
algorismo.⁴⁰

fol.47ra [Gerard of Cremona] De geomantie.⁴¹

I have not seen this MS, but the description given by its cataloguer makes it very likely that the Compotus prosaicus is the Compotus ecclesiasticus.⁴² Its incipit and explicit are those of the latter treatise. The title contrasts it with the Compotus metricus of Alexander de Villa Dei.

BL MS Egerton 2261.

Vellum, 13c Two former owners of the MS are indicated:
fol.1r Liber Johannis Meredyth; fol.51v Walter Cooke of
Weeles, haberdasher of hettes.

fol.4r theological tracts.

fol.208r Alexander de Villa Dei, Compotus versificatus
cum glossi et regule algorismi. This is followed by a
calendar and tables, some lines from Bede and Dionysius,
and an "analysis of the Computus of John of Sacrobosco".

³⁹See note to Add.27589 fol.28r.

⁴⁰See note to Ashm.1285 fol.90ra.

⁴¹A.de Poorter, Catalogue des Manuscrits de la
Bibliothèque Publique de la Ville de Bruges, p.619.

⁴²See p.108.

The latter is a selection of extracts from the Computus ecclesiasticus. There are 14 folios missing.

fol.224r G[alfridus de Vino Salvo] De artificio loquendi (fragment).

fol.224v Computus manualis, preceded by William de Longchamps Commendacio huius operis Magistro.

fol.225v Algorismus (printed by L.C.Karpinski, "Two Twelfth Century Algorisms", Isis 3 (1921), 403-412).

fol.227v Theological treatises.⁴³

4. MSS used in the Edition.

Of the texts which I have identified as the Computus ecclesiasticus, three (BL.MS Add. 27589; Oxford, Bodl.MS Ashm.1285 and Oxford, Corpus Christi College 293B) are described by their cataloguers as thirteenth century; one (Oxford, Bodl.MS Can.Misc.71) as thirteenth - fourteenth century; three (Oxford Bodl.MS 679, Cambridge, Pembroke College MS 278 and Dublin, Trinity MS 441) would appear to be fourteenth century; one (Oxford, University College MS 26) is fifteenth century. Dublin, Trinity MS 441 is an abbreviated text; Cambridge Pembroke College MS 278 contains much additional material, and some important differences in the order of material: they were not therefore suitable for collation.

⁴³Catalogue of the Additions to the Manuscripts of the British Museum in the Years 1864-1875, ed. E.H.Bond, 1015-1017

The versions of the treatise which have been collated in this edition appear to represent three distinct textual traditions. Of the thirteenth century texts, those in BL Add. 27589 and Corpus Christi College 293B are most similar, although the latter MS is short of one folio. The texts in Can.Misc.71 and Bodl.679 show similar variants. Bodl. Ashm. 1285 and University College 26 seem to belong to the same tradition. These last two MSS appear to be nearest to the text that John of Sacrobosco used; but the De anni ratione has similarities with the other texts, as a study of the listed variants in comparison with Sacrobosco's text will show.

Since it was not possible to produce a definitive edition of the treatise on the basis of a few examples of what was presumably a widely-disseminated text, it was tempting to assume a "standard" edition, familiar to Sacrobosco, and still in use in the fifteenth century. In this case, Bodl. Ashm.1285 would have been the best basic text for this edition. But material tends to accumulate around treatises of this kind (Trin 441 is an exception, since it is an intentional abbreviation) and Bodl.Ashm.1285 appears to contain extra material. None of the MSS is free from inaccuracies, but of the 13c texts, Bodl.Ashm. 1285 is the most carelessly written, with the most mistakes.

I decided, therefore, to base my edition on BL Add.27589, since it is carefully written and punctuated, representing

as far as possible with modern punctuation the rhythms of this version. The decision in the end was an arbitrary one, since the variants between the six texts I have collated are mainly of minor importance, affecting order rather than content. I have deviated from the text of BL Add. 27589 as little as possible, adding additional material from the other MSS only when essential to make sense of the text, and correcting obvious mathematical and verbal errors.

I have reproduced the mixture of Roman and Arabic numerals as they appear in this MS. A similar (although not identical) mixture is to be found in all the cited MSS, and none appears to be consistent in their use⁴⁴.

I have noted all variants in the texts, with the exception of minor variations in word order or in spelling. The most frequent spelling variations are as follows:

athomus/atomus/atthomus; bisextus/bissextus;
calo/kalo; caret/karet; cenit/cenith; dia/dya;
hiems/hyemps; hiemale/yemale; horizonta/orizona;
Idus/Ydus; litera/littera; martis/martii; mayus/maius;
sabatum/sabbatum.

⁴⁴See pp.139-140.

COMPOTUS ECCLESIASTICUS

1577-1578

- ba London, Guildhall Library MS. A. 11. 27139 (MS. 11)
- cc Oxford MS Corpus Christi College 1938 (MS. 11)
- A Oxford MS Bodleian Library Ashmole 1295 (MS. 11)
- D Oxford MS University College 26 (MS. 11)
- C Oxford MS Bodleian Library Can. Misc. 71 (MS. 11)
- B Oxford MS Bodleian Library 578 (MS. 11)

Conspectus Siglorum

- Ba London, British Library MS Add. 27589 (xiii).
cc Oxford MS Corpus Christi College 293B (xiii).
A Oxford MS Bodleian Library Ashmole 1285 (xiii).
U Oxford MS University College 26 (xv).
C Oxford MS Bodleian Library Can. Misc. 71 (xiii-xiv).
B Oxford MS Bodleian Library 679 (xiv)

Compotus est scientia considerans tempora distincta
 secundum motum solis et lune. Scientia ponitur ut genus;
 per hoc quod additur considerans tempora denotatur
 compoti materia. Tempus enim est materia circa quam agit
 5 compotista, non tamen quolibet modo consideratum; et ideo
 subiungitur distincta secundum motum solis et lune.
 Compotus enim considerat tempora mensurata secundum motum
 istorum duorum planetarum. Fecit enim Deus duo luminaria
magna, luminare maius ut preesset die, scilicet solem,
 10 luminare minus ut preesset nocti, scilicet lunam; non

1 Capitulum .1. U; Hic incipit compotus Roberti
 Grosseteste/Capitulum 1 de 2ci anno. Multiplex est annus
 scilicet solaris et lunaris quia secundum cursum istorum
 duorum planetarum solis et lunae considerantur tempora
 secundum ecclesiam. Set quia quedam incidunt in anno
 solari ut bisextus et concurrentes et regulares feriales
 et quedam in anno lunari ut embolismos et alia sunt que
 variantur ut .V. festa mobilia. scilicet. septuagesima
 quadragesima pascha rogationes et pentecostes propter
 necessitatem fuit scientiam invenire que omnia ista
 posset rectificare et hec compotus nominatur. Subiectum
 autem huius scientie est tempus. non dico tempus secundum
 substanciam temporis nec in quantum est motus primi
 mobilis set in quantum describitur in partes suas que
 considerantur ab ecclesia secundum motus solis et lune.
 Set quia in unocunque oportet scire quod sit dicimus quod
 B 2 motum] motus C ponitur ut genus] tamquam C;
 apponitur pro genere B 3 additur] dicit B. denotatur]
 notatur BC 4 compoti] illius B Tempus ... materia] om
 B 5 tamen] enim A quolibet modo] qualibet materia B;
 consideratum] considerata B considerant C consideratur
 tempus U 6 subiungitur] subiungit C motum] motus C
 7 Compotus] compotista ABU motum] motus C 8 deus] om
 CU duo] ista duo BC 9 magna] om C scilicet solem] om
 ABC 10 scilicet lunam] om AB non] nec BU

8-10 Gen 1,16.

curat motus aliorum planetarum. Unde patet quod compotus
differt ab astronomia et astrologia, que considerant
motus omnium planetarum. Tempus quod est materia compoti
sic describitur a Tullio: Tempus est pars eternitatis

U26v

5 annui mensurni / ebdomatici diurni nocturni spacii
certa dimensione. Compotista autem quandoque assumit
partes temporis maiores diei, quandoque minores. Partes
temporis maiores diei sunt septimana, mensis, annus,
lustrum, indictio, seculum et evum. Quid sit unumquodque
10 istorum satis patebit in consequenti. Partes minores diei
sunt quadrans, hora, momentum, uncia, athomus. Quadrans
est quarta pars diei naturalis, id est sex hore. Hora vero

1 curat] curat autem C; curant U motus] de motibus AU
unde] et propter hoc B; et per hoc C 1-3 unde
...planetarum] om U 2 et astrologia] et ab astrologia C;
om B que considerant] quia hec considerat B 3 motus]
motum A Tempus] tempus igitur BCU; tempus ergo A
4 describitur] distinguitur B eternitatis] eternitatis
cum AUC 5 annui ... ebdomatici] om B ebdomatici]
ebdomatici et Acc nocturni] nocturnive BCU 6 certa] cum
certa B dimensione] demensione U Compotista autem] om
C; Item compotista B assumit] adsumit C; sumit U
7 temporis om B diei] die AC 8 temporis] om B diei]
die AB; om C 9 et] om B 9-10 Quid sit ...consequenti]
Quid dies. quid septimana. quid mensis. quid annus patet
omnibus. Lustrum est spacium .V. annorum. Indictio est
spacium .XV. annorum. Seculum est spacium .C. annorum.
Evum vero mille annorum. et secundum istas partes
procedimus in tractando. C; Quid sit septimana. quid
mensis. quid annus satis scitur. Lustrum autem est
spacium .V. annorum. Indictio .XV. annorum. Seculum
centum annorum. Evum .m. annorum. et secundum has partes
procedemus in tractando B 10 satis] bene sic U
consequenti] sequenti U partes] item partes B; partes
vero U diei] die ABCU 11 sunt] sunt iste C athomus] et
atomus C 12 id est sex hore om B; scilicet .VI. hore C
vero] autem C; om AB

4-6 Ciceronis De inventione Rhetorica 1,26,39.

Ba13rb est vigesima / quarta pars diei naturalis;
momentum est quadragesima pars hore; uncia est duodecima
pars momenti; atthomus est quadragesima septima pars
uncie. Dierum vero alius naturalis, alius artificialis.
5 Dies naturalis est spacium ab ortu solis ad ortum: 24
U27r horarum. Dies artificialis est quam diu / sol est in
nostro emisperio. Notandum quod dies naturalis secundum
diversos diversa habet principia. Christiani enim
10 incipiunt diem naturalem a media nocte et ibidem
terminant, hac ratione, quia legitur quod Dominus natus
cc326rb erat in medio noctis dominice. Arabes vero a meridie, /
A107rb quia dicitur quod sol factus est in meridie /
secundum motum cuius considerant diem naturalem.

1 vigesima quarta pars diei naturalis] Vita pars
quadrantis B; 12a pars diei naturalis U 3 quadragesima
septima] XLVIII^a A 4 Dierum vero] Nota ergo quod dierum C;
Notandum ergo quod dierum B; preceded by 2 in margin U
alius ... alius] alia ... alia U 5 Dies] om BC
spacium] spacium temporis AUcc ad] usque ad AccU
6 ortum] ortum id est spacium AUBC 6 sol est] sol
moratur Acc 7 nostro emisperio] emisperio nostro. id
est. ab ortu solis usque ad occasum U Notandum]
Notandum igitur AU; Nota iterum C; Item notandum B
9 media nocte] medio noctis C 10 terminant] terminant et
U hac ratione] om C quia] quoniam AccU legitur] om C
10-11 quod dominus natus erat] Christus natus est C;
dominum fuisse natum 11 noctis] noctis diei AC; nocte
diei B dominice] B adds Nam posita causa efficiente et
immediata et ponitur eius effectus. Set Christus est
causa efficiens et immediata diei ergo quando incipit
esse oriatum ab ipso. set hoc fuit dies quare tale hora
incipit dies. quod supponandum est secundum ecclesiam.
vero] vero sive caldei A; om C; incipiunt diem B; vero
econtra U 12 quia dicitur] dicentes B 13 secundum] et
secundum U

C31vb Judei a tempore vespertino, / innitentes illi
auctoritati Genesis: factum est vespere et mane dies
unus. Quidam autem secundum sensum agentes ut vulgus
incipiunt diem naturalem ab ortu solis, quia cum sol
5 efferatur supra nostrum horizonta et sit causa diei, tunc
U27v merito debet incipere dies / cum ascendat sol.
Notandum etiam quod dies septimane secundum diversos
diversa habent appellationes. Philosophi enim denominant
quamlibet diem septimane ab illo planeta qui dominatur in
10 prima hora illius diei. Dicunt autem quod successive
B65b dominantur planete per horas. / Sunt autem vii
Ba13va pla/nete quorum nomina et ordo ciclorum ipsorum
planetarum possunt retineri per hunc versum:

Cynthia, Mercurius, Venus et sol. Mars, Iove, Satur.

15 Supponitur igitur quod Saturnus dominatur in prima hora

1 Judei] Judei autem incipiunt B; Judei autem C; Judei
vero U vespertino] vespertino. id est. apodiantes U
innitentes] innitantes A; intendentes C 1-2 illi
auctoritati] illam auctoritatem A 2 Genesis] om BC
3 autem] om C; vero BU 4 naturalem] om C sol] sol tunc
B; 5 sit] et cum sol sit C; sol sit B 6 merito] de
merito cc dies] dies naturalis BC ascendat] ascendit
AUBC; C adds et secundum hoc procedit astronomie; B adds
et secundum hoc procedit iudicia astronomie 7 Notandum
etiam] Notandum igitur A; Item nota BC 8 philosophi
enim] Nam philosophi B 9 illo] eo C 10 autem] enim B
11 planete] om A 12 autem] quidem B circulatorum]
circulatorum suorum U 13 ipsorum planetarum] om AU; istorum
B 16 possunt] om U retineri] haberi AU; retini B;
inveniri cc hunc versum] hos versus C 14 Cynthia]
Cincia C satur] U adds Ordine retrogrado primam quisquis
tenet horam U 15 Supponitur] Supponatur AUC igitur]
ergo A dominatur] dominetur BC

2-3 Gen 1,5.

diei sabbati, Jupiter in secunda, Mars in tertia, sol in
quarta, Venus in quinta, Mercurius in sexta, luna in
septima, iterum in quartadecima, similiter in vicesima
U28r prima, Saturnus / vicesima secunda, Jupiter
5 vicesima tertia, Mars 24^a. Et cum non sint plures hore in
illa die naturali relinquatur quod sol dominatur in prima
hora diei subsequentis. Unde ille dies dicitur dies
solis, et consimili computatione habetis quod luna
dominatur in prima hora diei subsequentis diem solis, et
10 inde suscipit appellationem, et ita de aliis. Secundum hoc
quidam medici cum dant potiones vel faciunt minutiones
considerant utrum planeta sit benivolus vel malivolus qui
dominatur in illa hora. Ex hiis autem solvitur hec
U28v questio: a nominibus planetarum denominantur dies
15 septimane, set quidam est ordo in planetis quo ad
circulos suos. Quare igitur dies septimane non

2 luna] Item luna dominetur C; Item luna dominabitur B;
3 Iterum] et iterum U Similiter] et post BC; et rursum U
4 Saturnus] Saturnus in ABC (passim in this passage)
4-5 Saturnus ... 24^a] Saturnus vero in VIII et iterum in
XV et rursum in XVI et iterum in XXII Item jupiter in IX
et in XVI et iterum in XXIII. Mars vero iterum in X XVII
et rursum in XXIIII et sic terminatur dies naturalis U
6 illa] om BC die] om cc dominatur] dominabitur B in]
om cc 7 subsequentis] sequentis Acc 8 et] om BC
habetis] habebis BC; habemus U 9 subsequentis]
sequentis AUBCcc 9-10 et inde suscipit appellationem] om
C hoc] hoc autem AU 11 cum dant] cum dent cc; fundent
Ba potiones] potionem B faciunt] faciant cc
minutiones] minutiones Ba; diminutiones C 12 sit] om
ACcc qui] om CccU 13 dominatur] dominetur C Ex] et ex
C; et U autem] om BCU 13-14 solvitur hec questio] potest
solvi quedam questio que sic sit BC; scitur quomodo U
15 in planetis quo ad] planetarum secundum B 16 quare
igitur] quare ergo A; quia ergo quare B.

denominantur secundum istum ordinem planetarum ut statim
diem saturni sequeretur dies iovis, et hunc dies martis,
Ba13vb et ita de / aliis, ratio huius est: quod 24 hore
cc326va distribute sunt planetis. Septem / autem sunt
5 planete. Unde si quilibet illorum assumat sibi tres
A107va horas supererunt de 24 horis / tres hore
attribuende tribus planetis. Unde patet quod si aliquis
dies denominatur ab uno planeta, dies sequens
C32ra denominabitur a planeta tercio post. / Christiani
10 autem sicut Beda, Jeronimus, et alii viri religiosi
U29r primam diem septimane appellaverunt / diem
dominicum sive primam feriam dominicum, quia tali die
natus est Dominus, tali die resurrexit, tali die mundum
fecit. Feriam, quia feriare idem est quod celebrare, et
15 die illa quam dicimus diem dominicum debemus cessare ab
omni opere peccati. et etiam manuali. Vel dicitur feria

1 istum] istorum cc planetarum om C statim] scilicet
post U 3 Ratio] Set ratio B; causa C hore] om U
4 distribute] distincte et distribute B 4-5 Septem autem
sunt planete] qui sunt 7 U 5 illorum] om Acc; istorum C;
eorum B assumat] adsummat C 6 supererunt] superflue
erunt B 7 attribuende] distribute B Unde] et ex hoc BC
8 dies] om B uno] uno quolibet B 9 post] post illum BC
10 autem sicut] vero ut B Jeronimus] et Geronimus C
viri] om U 11 primam] primum AU appellaverunt] appellant
B; apellant C 12 dominicum] dominicam cc; om U 13 est]
fuit C tali] tali etiam B resurrexit] resurrexit a
mortuis C tali] et tali B 14 feriam] feria dicitur A;
feria autem C; feriam autem B 15 illa quam] illo quem BC
diem] om ccU dominicum] dominicum sive primam feriam
dominicam B cessare] celebrare U omni] om B 16 etiam]
om C

11-12 Cf. Bedae DTR 8, 58-59; Hieronymi In die
dominica paschae p.550,53. 15-16 Gen 2,3.

a ferendis victimis, quia olim festivis diebus ad templa
ferebantur victime et holocausta. Secundum diem septimane
appellaverunt secundam feriam, et sic de aliis. Nomen
vero sabati non mutaverunt, ut appellarent eum feriam
5 septimam, quia tali die requievit Dominus ab omni opere
quod patrarat, et iterum requievit in sepulcro. Sabbatum
enim idem sonat quod requies, et ideo retinuit nomen
U29v tale. / Judei autem alias habent dierum
Ba14ra appellationes. Primum enim diem septimane sabbatum /
10 appellant sicut et nos, quod Dominus tali die
requievit. Et secundum diem illum quem nos dicimus diem
dominicum appellant primam sabati. Unde illud: mane prima
sabati, id est prima die post sabbatum. Diem vero quem
nos dicimus diem lune appellant secundam sabati, et ita
15 deinceps secundum ordinem. Dicitur autem dies a diis:

1 quia] quoniam Acc 1-2 ad templa ...victime] solebant
ad templa offere victimas C 3 sic] ita C 4 vero] om
Acc; tamen C; autem B eum] eam U 6 Et iterum] posterea
tali die A; Item B; et iterum tali die U 7 enim] itaque
A; autem C; om U idem] om U 8 Judei autem] Item iudei
C; Item etiam iudei B; Judei quidem A; Judei vero U
9 Primum] primam U enim] om C septimane] dierum AU; om
cc; Ba adds primum enim diem septimane appellationes
10 appellant] appellantes BC et] om C nos] nos deus
requievit etc; nos ultimum diem septimane B tali die] om
AccU; in eo B requievit etc. AUB 11 et secundum diem
illum] Diem illum AccC; Diem vero U diem] om AccC
12 appellant] appellant ipsi B sabati] sabati. et ita
per ordinem de aliis B illud] illuc A 13 sabati] sabati
etc U prima] primo Acc sabbatum] om U Diem vero] Item C
13-15 Diem vero ... secundum ordinem] om B 14 secundam]
sabbatum U 15 deinceps] de aliis C secundum] per A
autem] itaque B diis] dis A

5-6 Gen 2,2. 12-13 Marc 16, 19.

quidam enim dicunt planetas esse deos a quibus
denominantur dies. Vel dicitur a dyan, quod est clarum;
vel dicitur a dya, quod est duo, quia dies naturalis
dividitur in diem artificialem et noctem.

5 Sequitur de septimana. Notandum quod septimane non

U30r habent proprias ap/pellationes sicut dies, cum propter
earum multitudinem - sunt enim 52 septimane et unus dies
in anno - tum propter hoc, quod in uno anno est aliquod
spacium septimane quod in alio est partes duarum

A107vb 10 septimanarum. / Quod sic patet: si in hoc /

cc326vb anno aliquod festum sit in die sabbati, idem festum in
anno sequenti erit in die dominica. Unde illud festum
quod terminat septimanam in hoc anno erit inicium
alterius septimane in anno sequenti. Habent tamen

15 septimane communes appellationes has, scilicet ebdomada,
septimana et sabatum. Ebdomada dicitur ab ebda quod est

Ba14rb septem, et deas quod est dies, quasi septem /

C32rb ha/bens dies. Septimana dicitur a septem et /

U30v mane, quasi habens septem mane, id est tempora

20

quidam] quia quidam BC enim] om B dicunt] credebant B;
putabant C 2 dicitur] dicitur dies B clarum] claritas C
3 dicitur] om B quia] quoniam Acc 4 noctem] noctem
5 Capitulum 2 de septimana B Notandum] nota ergo BC
5-6 septimane ... habent] septimana ... habet A
6 proprias appellationes] propriam appellationem cum]
tum C 7 earum] eorum U multitudinem] valitudinem C
enim] autem Acc dies] diem C 9 spacium] spacium dierum
B septimane] septimana AC; in septimana B quod] et BC
alio est] alio illud non spacium septimana set C duarum]
enim A 10 Quod sic patet] et ex hoc patet B; quod ex hoc
patet C 11 sit] fit Acc 12 dominica] dominico B Unde]
videtis igitur quod C 12-13 illud festum quod] ergo quod
illud quod B; om quod C 13 in] om U 14 tamen] om U
15 has] om C 15-16 ebdomada septimana] ebdomadam
septimanam C 16 ebda] epta C 17 deas] doas AUBC
septem] om U

B66r matutina, et ibi sumitur pars pro toto. Sab/batum
appellant septimanam, quia per totam septimanam debemus
quiescere a peccato. Unde illud: Jeiunio bis in sabbato.
etc. Ex hiis patet quod sabbatum est equivocum ad unam
5 diem septimane et ad totam septimanam.

Sequitur de mense. Unde notandum quod triplex est
mensis, scilicet solaris, lunaris et usualis. Solaris est
quam diu sol moratur in signo peragrando. Lunaris idem est
quod lunatio, de qua dicetur postea. Usualis est illud

U31r 10 spa/cium dierum, scilicet, kalendariis inscriptum, et ab
antiquis celebratum. Notandum itaque quod Romulus primus
menses distinxit et annos, in anno suo x menses
constituens, hac ratione, quia ut dicitur tantum tempus
suffecit mulieri pregnantis ut pareret; vel quia per
15 tantum tempus debuit mulier abstinere a nupciis post

1 et ibi] hic C; om ibi B 2 appellant] aliter appellatur
B; appellatur C; appellant iudei U septimanam] septimana
B quia per totam septimanam] per quod significatur quod
tota septimana U 3 a peccato] ab opere peccato U illud]
illuc A; illud de phariseo U Jeiunio] ieiunio inquit U
4 etc] om C; id est in septimana U unam] unum B 5
totam] om C septimanam] septimanam. 6 Capitulum 3 de
mense etc B Sequitur] 4. Sequitur U Unde notandum] et
nota B; om unde C; unde notandum est U 7 lunaris et
usualis. Solaris est] om BC;... est spacium temporis A 8
in signo] in aliquo signo C; in uno signo cursum suum B
peragrando] peragendo BC Lunaris idem est] lunaris
scilicet et dicitur C 9 qua dicitur postea] quo dicitur
inferius BC est] om C 10 scilicet] om A kalendariis]
in kalendariis A; quod in kalendariis nostris est U
kalendariis nostris BC 11 Notandum itaque] Notandum
igitur AU; Nota ergo BC primus] primo B 12 distinxit]
distinguit Acc 7 annos] annum C 13 quia ut dicitur]
quoniam vidit quod AUBC 14 suffecit] sufficit CU
pareret] pariat BC per] om U 15 abstinere] abstinere se CU

3 Luc. 18,12.

mortem mariti sui. Primum mensem suum denominavit a Marte
patre suo; vel a marte, id est a bello, quia tunc reges
Romani solebant procedere in expeditiones. Secundum
mensem appellavit Aprilem, ab aperiendo, quia tunc pori
U31v 5 terre aperiuntur, et procedunt herbe et folia in /
Ba14va arboribus; vel Aprilis quasi / Afrilis. Venus enim
Frodissa dicitur a frodos quod est spuma maris de qua
A108ra nasci fingitur. Et ipsa fuit generationis /
Romulee principium ex parte matris sue. Tercium
10 appellavit Mayum a maioribus. Quartum Junium a
iunioribus. Menses sequentes appositis dictionibus
numeralibus appellavit, ut Quintilem, Sextilem,
Septembrem, Octobrem, Novembrem, Decembrem. Unde Ovidius:
Tercius a senibus iuvenum de nomine quartus.
15 Que sequitur numero turba notata suo est.
U32r September dicitur quasi septimus ymber, / ab
cc327ra ymbre, id est a tempore pluvioso, sicut a tempore

1 Primum mensem suum] Primum mensem igitur AU
denominavit] denominavit marcium AU 2 bello] bella U
3 secundum] et secundum Acc ab aperiendo] om U
6 aprilis] aprilis dicitur AUBCcc quasi] id est C enim]
om AU 7 frodissa] frodida cc maris] om Ba 8 nasci]
venus nasci B et] quia C 9 romulee] romuli U Tercium]
tercium mensem AU 11 iunioribus] iuvenibus C Menses]
menses vero AUBcc; menses autem C 13 septembrem]
septembrem et U; septembrem et ita deinceps C octobrem
novembrem decembrem] om C ovidius] december Ba; ovidius
de fastis U 14 Tercius] tertium A 15 notata] vocata U
suo est] sua C 16 quasi septimus ymber] quia septimus
est ab ymbre U; om ymber ccBC 7 id] hoc AU pluvioso]
imbrioso BC sicut] sicut enim A

14-15 Ovidii Fasti 1,41-42.

Februarii, et ita de aliis. Set postea sequens Numa Pompeius adiecit duos menses, scilicet Ianuarium et Februarium. Unde Ovidius:

At numa nec ianum. nec avitas preterit umbras.

5 Mensibus antiquis preposuit que duos.

Dicitur autem Ianuarius a ianua, quia sicut per ianuam est introitus in atrium, ita per Ianuarium in annum;

C32va

/ vel dicitur a iano qui fuit biceps, ita quod

Ianuarius duplicem habet faciem, quia videt finem anni

10 terminantis ad ipsum, et principium incipientis ab ipso.

Februarius dicitur a Februo, id est a Plutone, quia tunc

U32v

solebant sa/crificia facere pro animabus /

Ba14vb

antecessorum; vel dicitur a febre, quia tunc

febricitare solebant homines. Licet igitur Numa annum

15 suum ex xii mensibus fecerit, tamen diminute egit, quia

menses sumpsit lunares, unum scilicet 30 dierum et

reliquum 29, et ita annus suus constabat ex 354 diebus,

qui numerus non sufficit cursui solis. Sequens igitur

1 ita] similiter AU; sic C; sic deinceps B 2 pompeius] pompilius BC scilicet] om B 5 que] om U 7 est] fit B 8 fuit] fuit deus AU ita quod] ita AUBCcc 10 terminantis] finientis A; terminanti U ad] in B principium] principium anni AUBC 12 solebant ... facere] faciebant C solebant] solebant romani AU facere] facere plutoni AUC 14 licet] Set licet U 15 suum] om C fecerit] om cc egit] fecit egit U 16 sumpsit] adsumpsit C; assumpsit B scilicet] id est C et] om C 17 suus] om C 18 numerus] numerus dierum ccU

4-5 Ovidii Fasti 1,43-44.

Iulius Cesar ultimam correctionem apponens undecim dies
 adiecit et quadrantem. Unde annus Iulii constabat ex
 365 diebus et vi horis. Superflue tamen assumpsit viii
 momenta, ut patebit inferius. Tempore autem Iulii Cesaris
 A108rb 5 Romani adulantes Iulio mensem qui prius dicebatur /
 U33r Quintilis / Iulium appellaverunt, quia in
 tali tempore legitur Iulium esse natum. Postea similiter
 adulantes Augusto mensem prius dictum Sextilem Augustum
 appellaverunt. Qui autem menses usuales plures habeant
 10 dies, qui pauciores, scitur hiis versibus:

Sep, No, Iun, 30, Aprili dato, reliquis magis uno.
 Ni sit bisextus, Februus minor esto duobus.

In quolibet vero mense sol dicitur novum signum intrare;
 et est signum certum spacium zodiaci ab astronomis
 15 dictum. Habet etiam quodlibet signum specialem
 B66v appellationem ut / patet hiis versibus:
 Ba15ra Est Aries, Taurus, Gemini, Cancer, Leo, Virgo./
 Libraque Scorpius, Architenens, Caper, Amphora, Pisces.
 U33v / Primum signum est Aries, quia secundum quod credit
 20 Ecclesia in eo factus est sol, licet dicant Arabes quod

1 correctionem] correptionem C 2 constabat] constat C
 3 assumpsit] adsumpsit C 4 autem] vero BC 5 prius]
 primo B 6 in] om BC 7 tali tempore] tali quidem mense
 B; tali mense A iulium esse natum] iulius esse natus BC;
 iulium fuisse natum A Postea] postea etiam C 8 prius
 dictum] qui primo dicunt B 9 appellaverunt] appellabant
 AccC habeant] habent CU 10 qui] et qui Acc 13 In] Item
 in BC; Et notandum quod in U vero] quidem A; om BCU
 sol] om U 14 et est] est autem AU astronomis]
 astronomis ita AU 15 dictum] diffinitum B Habet etiam]
 et habet BC; habet autem AU 16 ut] quod A; quemadmodum U
 hiis versibus] per hos versus BCccU 19 pisces] piscis U
 signum] signum ergo BC; signum igitur U 20 eo] ea U
 licet] set C

cc327rb sol factus sit in Leone. Et dicitur Aries quia /aries est
animal quod in parte anteriori viget, in parte autem
posteriori debile est. Ita sol existens in illa parte
zodiaci que dicitur Aries in tempore hiemali parum habet
5 virtutis, scilicet caloris et siccitatis, in parte
anteriori magis habet virtutis, scilicet versus estatem;
vel ut dicunt quidam, aries tota hieme sinistro accumbit
c32vb lateri, estate / vero dextro: sic sol tota hieme
magis accedit ad emisperium inferius, estate vero ad
10 superius, quod est quasi dextrum latus. Secundum signum
dicitur Taurus, quia tunc labores taurorum sive bovim
apparent; vel quia sicut taurus est animal forcus ariete,
ita sol existens in eo forcior est in virtutibus quam
U34r fuit. / Tercium signum est Gemini, quia tunc geminatur
15 virtus solis in caliditate et siccitate; vel quia sicut
Gemini depinguntur iuvenes amplectentes se, ita quando
sol est in illa parte celi quedam terre nascentia
amplectuntur se per radices et pubescunt

1 sit] est AUB; fuit C quia] quia sicut AUB 2 quod] om
B viget] vicens B; forte est C 2-3 parte autem
posteriori] posteriori [autem] vero AU; om B 3 est] om
BC existens] cedens Acc 4 in tempore] a parte BC 5-6
scilicet ... virtutis] om Ba 7 ut] om C quidam] quidam
quod C tota] om U; totali B 8 dextro] dextro lateri C
tota hieme] om C; totali hieme B 9 inferius] inferius
tota hieme C vero] autem A; om B 10 est] est ei BC
Secundum] secundum vero U 11 taurorum sive bovim] bovim
et taurorum B; taurorum et bovim C 12 quia] om U
taurus] om C 13 in] om U 14 fuit] fuit prima C; fuit
prius B signum est] om c; dicitur B 15 caliditate]
calore BC 16 depinguntur] om A 17 terre] terrena A

superius in herba. Quartum signum est Cancer, quia sicut
 cancer est animal retrogradum, ita sol in illo tempore
 A108va recedit / a nostro emisperio. Unde illud signum
 Ba15rb dicitur tropicum quasi conversivum, / et in eo est
 5 solsticium estivale. Quintum est Leo, quia sicut leo est
 animal ardentissime nature et implacabilis ire, ita sol
 existens in illa parte celi ardentissimus est et
 siccissimus. Unde tunc non est bonum minui nec
 U34v purgationibus uti propter defectum humoris / in
 10 tempore caloris et siccitatis. Sextum est Virgo, quia
 sicut virgo sterilis est, ita tempus illud sterile est et
 nichil producit; set producta maturat. Septimum est Libra
 quia tunc est equinoctium autumpnale. Octavum est
 Scorpius, quia sicut scorpius pungit cum cauda, ita
 15 matutina parum cautos tunc frigora mordent. Nonum est
 Sagittarius, quia tunc in nos mittuntur sagitte temporis,
 tempestates scilicet, ymbres, grandines et huiusmodi.
 Decimum est Capricornus, quia sicut in pascendo erigit se
 caper, ita tunc sol ab inferiori emisperio versus nostrum

20

1 herba] herbam AU Quartum] Quartus U signum] om BC 1-2
 quia sicut cancer est] quia est C; quod est B 3 recedit]
 retrocedit C emisperio] emisperio accedens versus
 inferius BC unde] unde enim cc 4 tropicum] retrogradum
 A et] quia AU 5 Quintum] Quintum signum AccU 6 animal]
om C 7 existens] cedens A celi] om B est] om C 8 tunc]
om A bonum] bonum tunc A 10-11 in tempore] et intemperiem
 BC Sextum] Sextus A est] om C 11 est] om U et] quia
 BC 13 tunc] AU add libratur dies artificialis nocti et]
om BaBC est] om BC 14 cum] om Acc; in C 15 parum
 cautos tunc] incautos C Nonum] onum C; nonum signum U
 est] om C; dicitur B 16 tunc] om U temporis] temporis.
 id est C tempestates] om B 17 scilicet] scilicet yemis
 A; om C ymbres] om CU; imbres. tempestates B et] et
 nives et U 18 est] dicitur B; om C 18-19 sicut in
 pascendo erigit se caper] capricornus pascendo derigit se
 caper C caper] hoc animal B 19 sol] om A

accedit emisperium; et dicitur hoc signum tropicum, quia
 sol tunc convertitur ad nos; et est tunc solsticium
 hiemale. Residua vero duo signa, Aquarius et Pisces,
 cc327va notant habundanciam aquarum, / quia quando sol
 U35r 5 est in illis tunc habundant / pluvie; et dicitur
 Aquarius ab aqua et qualitate et aere. Quidam tamen
 dicunt quod hec signa denominantur a situ stellarum
 fixarum que sunt in illis partibus ad modum
 Ba15va anima/lium. Notandum etiam quod in quolibet mense
 10 sunt 3 dies principalia nomina habentes, a quibus
 denominantur alii dies mensis coassumptis dictionibus
 numeralibus, scilicet kalende, none et idus. Dicuntur
 C33ra autem kalende quasi colende, / quia primus dies
 cuiuslibet mensis colebatur ab antiquis in honore
 15 iunonis. Unde Ovidius:

Vendicat ausonias iunonis cura kalendas.

1 accedit emisperium] emisperium erigit se vel accedit
 sol hoc] om A 2 sol] om cc convertitur] vertitur A
 tunc] om AC 3 vero] om BC signa] signa scilicet B;
 tempora C pisces] pisces scilicet A 4 notant] om U
 sol] om A 5 habundant] abundant C et dicitur] dicitur
 enim BC 9 Notandum etiam] Item notandum BC quod] om Acc
 11 dies mensis] om mensis BC; tres A coassumptis]
 coadscritis cc; quo adsumptis C 12 scilicet] om Acc
 none] om A et] om BU autem] om A 14 colebantur]
 celebrabatur B 16 cura kalendas] festi kalendis C

16 Ovidii Fasti 1,55.

Vel dicuntur kalende a calo, quod est voco, quia preco
 prima die cuiuslibet mensis ascendebat locum eminentem in
 A108vb civitate et clamabat quater calo si nun/dine
 U35v debent du/rare per 4^{or} dies, sexies si per sex;
 5 et ideo dicuntur kalende in plurali numero, quia pluries
 clamabat calo; vel dicuntur kalende a calon quod est
 bonum, quia in prima die mensis mutuo solebant dari
 quedam dona ab amicis, ut per totum mensem omen bonum eis
 eveniret. None autem dicuntur a non quia nullus deus
 10 habuit festum in nonis. Unde Ovidius:

Nonarum tutela deo caret.

Vel dicuntur none quasi nove, propter statuta
 innovata et renovata in singulis mensibus quondam apud
 Romanos; vel dicuntur none a nundinis, quia per tot dies
 B67r 15 durabant quot sunt none. / Idus vero dicuntur quasi
 U36r divisiones, quia dividunt menses fere in duas partes /
 Ba15vb equales; vel quia dividuntur tunc nundine. /

1 calo] colo cc 2 prima] primo AccB 1-3 quia preco ...
 quater calo] om C 2 prima die cuiuslibet mensis] om B
 eminentem] preeminentem B 2-3 in civitate] om B 4 debent
 durare] om A; durature essent B; durarent U dies] dies
 quater solebant preclamare calon C sexies] om A si] si
 vero B; si nundine durarent U 5 numero] om BC 6 calo]
 calon C calon] kalo B 7 bonum] donum Ba prima] primo C
 mutuo] in initio Ba; 9 autem] om AB a non] om Ba
 10 ovidius] dicitur Ba 11 caret] daret U 12-13 vel
 dicuntur ... apud romanos] follows 14-15 vel dicuntur ...
 quot sunt none C 15 none] om U in] om B 14 per] om U
 14-15 vel dicuntur ...quot sunt none] om B 15 vero] om A;
 autem C dicuntur] dicunt cc 17 dividuntur] dividebantur
 ACU

11 Ovidii Fasti 1,57.

Ab istis diebus appositis dictionibus numeralibus
nominantur alii dies mensis, ita quod maiori numero
secundum quod magis antecedunt et minori secundum quod
minus. Si autem queratur quare non dicatur secundo
5 kalendas, dicendum quod hec dictio secundus provenit ab
hoc verbo sequor sequeris, unde illa dies deberet sequi
si recte diceretur secunda; set ibi bene dicitur pridie,
id est priori die ante kalendas. Quilibet vero mensis
habet viii idus. Unde versus:

cc327vb 10 Octo tenent idus menses generaliter omnes. /
Set quidam menses plures habent nonas, quidam pauciores.
Unde versus:

Mar, Ma, Iul, oc, senas, reliquis dato bis duo nonas.

Habito igitur quot dies habeat quilibet mensis sicut
U36v 15 patet ex predictis, et quot nonas, / et quot idus,
subtractis nonis et idibus residui dies erunt kalende.

1 istis] istis autem B numeralibus] numeros
significantibus C nominantur] denominantur B 2-3 dies
... antecedunt] dies sequentes at dies precedentes.
kalendas nonas et idus nominantur ab illis maiori numero
secundum quod fuerit magis remote C; et dies precedentes
kalendas nonas et idus nominantur ab illis maiori numero
secundum quod magis fuerit remota B 2 quod] om Ba et]
om A 4 autem] om B dicitur] dicatur AUCcc 5 kalendas]
kalendas sicut tercio vel iiiito set pridie kalendas BC
dicendum quod] ratio est C; dicendum est U 5-6 provenit
ab hoc verbo] provenit a B; dicitur a C sequeris] ris CU
unde] unde secundum hoc BC 7 secunda] secundo AC
pridie] pridie kalendas AccUBC 8 id est] a B vero] om
ABC 10 tenent] tenens A Set] item BC 13 mar] mars Ba
oc] octo A bis duo] biduo cc 14 Habito] haberi C
igitur] ergo AC dies] om C sicut] ut iam B
15 predictis] supradictis B et] et etiam C et quot
idus] om A 16 residui] relique U

Notandum etiam quod in quolibet mense sunt duo dies qui dicuntur egri, mali, Egipciaci. Egri, quia secundum opinionem quorundam, si quis egrotaret in hiis diebus vix vel nunquam evaderet. Mali, quia malum fuit incipere aliquod opus propter malas constellationes. Egipciaci, quia ab hiis erant inventi. Preter enim decem plagas notas / contingebant eis plura mala, que notabantur in / kalendariis suis bis in quolibet mense. / Quidam etiam in hiis diebus sacrificabant humanum sanguinem; unde / prohibitum est ne quis sibi minueret ne videretur sacrificare se demoni.

Observationes istorum dierum inhihet Augustinus dicens Kalendas mensium et dies egipciacos non observetis. Quia tamen illi dies sunt suspecti, ad illos habendos sciantur

15

1 Notandum etiam] Item nota B; Item notandum C 1-2 qui dicuntur] om A 2-5 Egri ... constellationes] om C 3 in] om cc diebus] duobus Ba 4 vel] aut B evaderet] convalescet B quia] quia secundum opinionem eorum B fuit] erat AU 5 opus] opus in hiis diebus A; om in BU 6 hiis] eis B erant] fuerit C; sunt B preter] preter vero cc; quia preter BC enim] om BCU 7 notas] notas que per hos versus sufficiter habentur. sanguis. rana. culex. musce. moriens pecus. ulcus grandio. locuste. nox. mors prius orta. necans A; nocivas que ... nox mox prius orta necans. prima ruben verba et cetera notas U contingebant] contingerant C plura] alia B; aliqua C 8 notabantur] vocantur Ba; notabant BC bis in] brevi Ba; om cc 9 etiam] om U in hiis diebus] om A sacrificabant] sacrificabant plutoni AUBC 10 quis] quis hiis dies ABU 11 sibi] om B se] om BC demoni] demoniis Ba 12 observationes] observationes autem C 13 kalendas] literas C non] ne B 14 tamen] om A ad illos habendos] om A; ad illos sciendos B; ad illos sciendos et habendos U sciantur] sunt B

13 Cf. S. Aug., Epist. ad Gal., PL 35, 2130.

hii versus:

Augurio decies, audito limite clangor. Linqvit,
olent, abies, coluit colus excute gallum.

In hiis versibus sunt xii dictiones servientes xii
5 mensibus, prima ianuario et sic deinceps. Ad habendum
U37v igitur priorum diem Egipciacum alicuius mensis /
sumatur prima littera prime sillabe dictionis servientis
illi mensi, et quota fuerit in alphabeto, tot dies
computa a principio mensis descendendo, et ubi terminatur
10 computatio talis ibi est dies Egipciacus. Ad habendum
secundum diem sumatur prima littera secunde sillabe
eiusdem dictionis et quota fuerit in alphabeto tot dies
computa a fine eiusdem mensis ascendendo, et habebis quod
queris, hoc etiam prenotato, quod H non computatur pro
15 littera.

Sequitur de anno. Unde videndum est quid sit annus,
et quare sic dicatur, et ubi habeat principium. Notandum
igitur quod multiplex est annus. Est enim solaris et

1 hii versus] hiis versibus Acc 2 limite] lumine AC
3 olent] olet BU abies] habies B coluit] colui cc
colus] lacuna Ba excute gallum] oscula gallus C 6 igitur
priorum] ergo primum BC egipciacum] om ABC; egiptiacum
scilicet cc 7 prima] om Ac servientes] deservientes
AccB 8 fuerit] est BC 9 et] om C 10 talis] om B est]
om A egipciacus] egri C ad] et ad B 11 secundum]
secundam U diem] diem egipciacum eiusdem mensis B
12 fuerit] illa fuerit BC 13 ascendendo] om A habebis]
habes B 14 queris] queritur AU; queretis cc 15 littera]
littera. Capitulum 4 de anno etc B 16 unde videndum est]
videndum ergo B 17 quare sic] unde A ubi habeat] unde
habet A; ubi habet cc 17-18 Notandum igitur] Nota ergo
B; nota ergo primo C multiplex] duplex C 18 est enim]
om BC solaris] annus solaris AU

U38r / lunaris. Annus solaris est illud spacium in quo
 sol moratur ab uno puncto zodiaci circuens totum zodiacum
 Ba16rb proprio / motu et rediens ad idem punctum.
 cc328ra / Unde apud antiquos solebat depingi serpens devorans
 5 propriam caudam, propter temporis revolutionem. Et
 dicitur annus ab an, quod est circum, et eo, is, propter
 predictam revolutionem. Secundum autem diversos
 A109rb / diversa sunt anni principia. Numa enim Pompeius
 annum suum incepit a solsticio hiemali, quia tunc incipit
 10 sol ascendere ad nos. Unde Ovidius:

Bruma novi prima veteris que novissima solis

Principium capiunt phebus et annus idem

(non tamen in eodem die licet in eodem tempore). Romulus

U38v vero annum / suum incepit a Martio iuxta equinoctium
 15 vernale, quia tunc omnia virent et florent. Secundum
 theologos etiam factus est mundus xv kalendas Aprilis.

1 lunaris] annus lunaris AU illud] illuc A spacium]
 spacium temporis AccU quo] om C 2 moratur] movetur BC
 3 proprio motu] om U idem] eundem B 4 solebat] solet
 Acc; annus solet U; annus solebatur B devorans] vorans
 BC propter temporis revolutionem] om AU; et hoc.
 scilicet. propter revolutionem temporalem BC 7 predictam]
 temporis AccU; iam dictam BC revolutionem] circuitionem
 BC autem] om AUBC 8 enim] om BC pompeius] pompilius BC
 11 prima] prima est C solis] solis. id est. anni B
 13 licet] set B; om C tempore] tempore. id est. in hieme
 B; tempore. scilicet in hieme C 14 vero] om B; autem C
 16 etiam] om AU

11-12 Ovidii Fasti 1,163-4.

C33va Arabes / a solsticio estivali, quorum opinio fuit
quod sol factus erat in Leone. Quidam incipiunt a
Septembri, sive ab equinoctio autumpnali, propter illud
B67v Genesis: / Protulit terra herbam virentem facientem
5 fructum iuxta genus suum; et autumpnus est tempus
fructuosum. Unde dicebant mundum factum esse in autumpno.
Ista principia imitamur in aliquo: nam claves terminorum
U39r et aureum numerum incipimus a Ianuario, a Martio /
Ba16va concurrentes et regulares / solares, a septembri
10 vero epactas et regulares lunares et embolismos.
Notandum quod in anno sunt quinquaginta duo septimane et
unus dies. Iste dies residuus variat septimanas, et est
causa quare festa sanctorum singulis annis variantur et
diversis feriis celebrantur; et etiam quare litere
15 dominicales variantur; et quod kalendarium incipit ab A
et terminatur in A; et est origo concurrentis. Quod festa
sanctorum variantur propter istum diem sic patet:

1 Arabes] Arabes vero AU; Arabes autem cc; Arabes annum
suum incepit B fuit] erat A erat] est AccBC 2 quidam]
quidam vero AU BaBC incipiunt] incipiunt annum suum B
3 ab] iuxta U illud] illuc A 4 terra] terram Acc
facientem] et ferentem Acc; et facientem U et] set AUBC
6 fructuosum] fructus B factum esse] om Ba; quod mundus
factus fuit C 7 imitamur] imitemur C 11 Notandum]
notandum igitur AU; nota ergo BC quinquaginta duo] om C
12 Iste] ille unus C; ille cc residuus] om C 13
variantur et] om BC 14 litere] dies Ba 15 quod] quare
BC; quia U incipit] incipiat C 16 et] et etiam B
17 propter] per AUBC

4-5 Gen 1.11,12

ponatur quod aliquod festum sit in hoc anno in die
dominica, in anno sequenti idem erit in die lune, et si
bisextus fuerit, in die martis erit. Hec eadem variatio
U39v est per singulas kalendas mensium. / Ad habendum
5 igitur generaliter et artificiose qua feria quilibet
mensis incipiat, inventi sunt duo numeri, unus variabilis,
scilicet concurrens, et alius invariabilis, qui dicitur
A109va regularis solaris. Con/currens est numerus
septenarium non excedens, proveniens ex superhabundancia
cc328rb10 / anni divisi per septimanas. Numerus dico large,
ut unitas numerus appelletur, quia quandoque unitas est
concurrens. Non excedens septenarium dico, quia
concurrens septem non transit, set petit assem, quia cum
tantum sint vii ferie in septimana, et concurrens et
Ba16vb 15 regularis habeant / ostendere pri/mam feriam
U40r mensis, neuter illorum excedet septenarium. Proveniens
etc. dico, quia ille dies qui relinquitur ultra
septimanas est causa concurrentis. Dico igitur quod
primus annus cicli concurrentium unitatem habuit pro

20

1 in] om BC 2 idem] illud idem festum B; illud etiam
festum C erit] fuerit U in] om B 3 fuerit] venerit U
in] om BC 4 est] erit U 5 igitur] ergo AccBC et
artificiose] om CU 6 incipiat] om cc unus] numerus C
7 scilicet] sicut BC et] om C qui dicitur] sicut BC
10 dico] om A; dico. sep. C; dicitur U 13 petit assem]
set post 7 redit ad unum. Unde versus. Concurrens septem
non transit set petit assem U quia] quare non transit
septem quia; et hec est causa quod C cum] om B 14 sint]
sunt B 15 habeat] habent AUBC ostendere] hostendere C
primam feriam] feriam primi diei BCU 16 illorum] eorum U
excedet] excedit AUBC 17 etc] ex superhabundancia C; ex
superhabundancia anni divisi per septimaneas cc dico
quia] Quare dicitur U 18 septimanas] septimanam Acc
est] esse U igitur] ergo BC 19 primus] proximus Ba
cicli] illi Ba; om U concurrentium] concurrentis C
habuit] habet B

C33vb concurrente, propter illum diem, secundus binarium,
tertius ternarium, quartus quinarium, uno die superaddito
propter bisextum, quintus 6, sextus 7, septimus /
unitatem, octavus 3 propter bisextum. Et eodem modo
5 computandum est donec perveniatur ad xxviii annum, ubi
U40v septenarius est concurrens, et annus bisextilis; et /
postea penitus redibit idem status in formatione
concurrentium. Unde spacium xxviii annorum dicitur ciclus
concurrentium. Per hos autem versus scitur quid sit
10 concurrens in quolibet anno:

Quam feriam martis .f. littera significabit:

Illius in numero concurrens serviet anno.

Vide quota feria significatur per primum F in martio et
tantus numerus est concurrens illius anni. Vel potest sic

15 haberi concurrens:

Sex habet A, B 5 tenet, post C 4, et D

tres habet, Eque duos, F unum, G quoque septem.

Quociens A est littera dominicalis senarius est

1 propter] per C diem] diem excrescentem U
5 perveniatur] perveniat A 6 bisextilis] bisexti A
7 penitus] omnino BC 7-8 in formatione concurrentium]
quod prius in concurrentium formatione A; prius in
concurrentium formatione cc; formatione concurrentium B;
informatione concurrentium C 8 Unde] Idcirco BC ciclus]
ciculus C 9 autem] om AUBC sit] est U 10 anno] anno
cicli Acc 10-17 quam feriam ...quoque septem] om B 13-
14 vide quota feria ...illius anni] om Ba: inserted after
quoque septem (line 17); Unde [vide cc] quota feria [que
BC] significatur per primam F in martio tantus numerus
est concurrens Acc 14 potest] possunt BC 15 concurrens]
concurrentes BC 17 e que
duos] e duos Ba 18 Quociens] Quociens enim AccU est]
fuerit U senarius] littera senarius cc; semper senarius BC

concurrens; quociens B, quinarium et ita de aliis.
 Mutatur autem concurrens in Martio, quia incipit a
 Ba17ra martio, et in ipso terminatur, / et variatur
 U41r singulis annis; set tamen unus servit uni anno toti. Et
 5 dicitur concurrens a con quod est simul, quia simul
 concurrit cum regulari ad ostendendum qua feria quilibet
 A109vb mensis incipiat. Regularis / solaris est numerus
 septenarium non excedens qui adiunctus concurrenti ferias
 mensium indicat. Numerus dico large ut prius. Non
 10 excedens septenarium ut prius. Illud membrum qui
adiunctus etc. ostendit tam officium concurrentis quam
 cc328va regularis. / Habet autem nunc et semper habebit
 quilibet mensis tot pro regulari a quota feria incepit in
 principio mundi. Mundus autem factus est xv kalendas
 U41v 15 Aprilis sicut / credit Ecclesia. Unde ibi solet
 notari primus dies seculi, et sol in Ariete. Unde versus:
 Principium mundi renovat .G. tertia Martis.

1 quociens B quinarium] om ABC 2 Mutatur autem
 concurrens] cum concurrens autem mutatur C a] in CU
 3 in ipso] in martio AU; in martium BC variatur]
 variantur B 4 unus] unus concurrens C servit] serviet
 Acc uni] om B 5 concurrens] om U a con quod est simul]
om BC 6 simul] simul et currere A; simul et currens U
 (second) simul] om BC 6 quilibet] om cc 7 incipiat]
 incipiat etc U est] om C 8 qui] qui 7 U 9 prius] supra
 B 9-10 non excedens septenarium ut prius] om A
 10 septenarium] septenarium Capitulum 6 de regulari
 solari B illud] illud vero Acc; istud U Illud membrum]
om B 11 adiunctus] adiunctus concurrenti C; adiunctus
 est U ostendit] hoc membrum ostendit B 12 autem] enim U
 nunc] om U 13 a] om U incepit] incipit mensis AUBC
 15 unde ibi] ubi B 16 notari] annotari B versus] om U
 17 renovat] serviat A

Constat autem quod primus dies seculi fuit dies dominica:
illa G igitur fuit littera dominicalis. Supposito igitur
quod per totum annum sequentem sit littera dominicalis,
patet qua feria menses incipiunt et ita patent regulares.

5 Habet Martius 5 pro regulari, ac sic haberet omnes dies
suos integros. Habito igitur uno regulari sicut regulari
Martis, sic formentur alii: sume omnes dies martis et
B68r regularem anni /, et iunge simul, et ab illis

U42r coniunctis subtrahe septenarium quotiens poteris;

10 et relinquetur unitas que est regularis aprilis. Et sic

Ba17rb agendum est de omnibus mensibus / sequentibus. /

C34ra hoc prenotato quod si nichil est residuum: septenarius
est regularis mensis sequentis. per hos versus possunt
sciri regulares omnium mensium:

15 Quinque.No.Mar.Iu.Fe.sex A Iul.assem.Sep De
que.septem.

Oc.duo.Ma.Ia.que tres habet.Au.duo bis regulares.

vel sic:

1 Constat] cunstat C autem] ergo AB; quidem cc 2 illa]
ergo BC igitur] littera igitur cc; om BC 2-3 Supposito
... dominicalis] om Ba 4 incipiunt] incipient B ita] ita
per consequens AccU patent] patebunt U habent] habent
autem AUBC 5 ac sic] sicut BC haberet] diceret A;
habuisset B 6 igitur] ergo ccB sicut] sincti C
7 formentur] formantur AU martis] om A 9 coniunctis]
iunctis ccBC 10 relinquetur] relinquatur B; relinquatur C
que] que unitas BC et] etiam C 11 omnibus] omnibus
aliis BC 12 hoc prenotato] hoc etiam notato C; et hoc
etiam notandum B; hoc etiam prenotato U est] fuerit
AUBC; sit cc 13 est] erit B regularis] pro regulari A
hos] hos autem AUB possunt] potest U 14 sciri] sciri per
hos versus C regulares omnium mensium] sine labore omnis
regularis A; om regulares C 15 sex] om A 17 oct] oc AUBC

Expugnans alios casus facit aspera dives.

Gaudet blandus egens, gaudia cessa ferens.

Hic sunt xii dictiones xii mensibus servientes, prima
U42v Marcio / et ita deinceps. Quota igitur fuerit prima
5 littera alicuius dictionis in alphabeto, tot habet ille
mensis pro regulari cui servit illa dictio. Habitis
igitur concurrenti et regulari, insimul iungantur,
A110ra / et si ex illorum coniunctione excrescat
septenarius vel minor numerus, a tali feria incipit
10 mensis cuius regularem sumpsisti. Si maior quam
septenarius, reice septenarium, et quotus est numerus
residuus, a tanta feria mensis incepit mensis cuius
regularem sumpsisti. Dicitur autem regularis quia
regularitur currit cum concurrente ad demonstrandum
15 primam feriam mensis; et dicitur solaris ad differentiam
regularis lunaris. Notandum etiam quod habito per
U43r concurrentem et regularem qua feria / mensis incipiat, si
cc328vb nesciatur littera dominicalis, per hos versus invenitur: /

1 expugnans] expugnant Acc alios] alias U casus] casu
AUBC facit] fert AU; sunt cc 2 cessa] celsa AccUC
4 marcio] marcio. secunda aprili U ita] sic B deinceps]
de aliis C igitur fuerit] fuerit cc; ergo est BC
6 servit] deservit AccU Habitis] habito AU 7 igitur]
ergo BC concurrenti] concurrente AUBC insimul] simul
AU; om C 8 illorum] eorum B coniunctione] iunctione C
excrescat] excrescit B 10-12 Si maior ... mensis
incept] om C 11 reice] eice B est] erit AU; fuerit cc
numerus] mensis Ba 12 tanta] tali B; tota U incepit]
incipit AUBC 13 sumpsisti] sumpsistis cc; assumpsisti U
14 demonstrandum] ostendendum AccU primam] om BaAUBC 15-
16 et dicitur ... regularis lunaris] om U 16 etiam] ergo
B quod] om C 17 concurrentem] concurrentes C qua] a
qua BC 18-19 per hos versus] om BCU invenitur] ex
facili sic scitur BC; sciri potest U

Altitonans dominus divina gerens bonus exstat.

Bal7va

Gratis celi fert aurea dona fide/li.

In hiis versibus prime litere xii dictionum ostendunt litteras inchoativas mensium. Habito de aliquo mense qua
5 feria incipiat, et iterum habita prima littera mensis per dictiones versuum, illa littera servit illi ferie a qua
5[?] mensis incepit; deinde facto decensu tam in litteris quam in feriis donec perveniatur ad primam feriam, et statim patet littera dominicalis. Per predictos etiam versus

U43v

10 scitur quot dies habet quilibet mensis, hoc supposito, / quod quilibet habeat xx et viii. Deinde videatur distancia prime litere unius dictionis ad primam litteram sequentis dictionis ita tamen quod una includatur, reliqua excludatur computando, et quota
15 fuerit illa distancia, tot unitates adduntur 28, et tot dies habebit ille mensis cui servit dictio precedens; hoc notato quod si velis scire dies Decembris, oportet utramque litteram includere. Et hoc est quod kalendarium

1 gerens] gerit B 2 fert] fuerit cc 3 hiis] om C
4 habito] habito igitur AU; habito ergo cc 5 iterum] item B habita] habito Acc 6 dictiones versuum] predictos versus B 7 incepit] incipit incipit AB; incipiat C litteris] feriis C 8 feriis] sillabis Ba; literis C et] om BC 9 per predictos etiam] per predictos cc; item per predictos BCU versus] versiculos U 10 scitur] potest scire BC habet] habeat AUBC 13 quod una] quod una prima cc; ut prima litera B; ut si prima litera C 14 reliqua] et reliqua AccU computando] in numerando B; numerando C 15 fuerit] est BC distancia] distancia in alphabeto ccU 16 ille] om C 16 servit] deservit AU dictio] illa dictio A hoc] hoc etiam Acc 17 notato] prenotato U

incipit ab A et terminatur in A. Habent autem versus
iniciu[m] a Ianuario.

Sequitur de bisexto. Unde videndum est quid sit

bisextus, et quare sic dicatur; et ubi

- U44r 5 inter/ponitur /; et quomodo possit
A110rb inveniri per annos domini; et quis error contingerit si
C34rb bisextus non observaretur. Notandum igitur quod Iulius
Ba17vb Cesar et alii / sapientes perceperunt solem morari
in quolibet signo per xxx^a gradus et 30 trientes hore et
10 30 bisse momenti. Gradum appellant tantum spacium quantum
sol assumit in die naturali. Ex eo igitur quod sol
moratur in quolibet signo per 30 gradus (et xii sunt
signa) erunt xii 30 gradus, id est 360, et per consequens
totidem dies. Triens autem est tertia pars alicuius
U44v 15 integri. Triginta ergo trientes hore faciunt x /
horas; et cum sint xii signa, erunt duodecies x hore,
hoc est decies xii, id est quinquies .24. hore, et ita
quinque dies. Et sic habemus 365 dies ex gradibus et

1-2 habent autem versus initium a ianuario] om BC
1 autem] om A versus] versus illi ABC; versus predicti U
3 Sequitur de bissexto. Unde] om BC; preceded by 8 U
quid] quod Acc; quit U 4 bisextus et ubi interponitur B;
et quare sic dicatur] om CU sic] Capitulum 7 de bissexto
B 4-5 et ubi interponitur] om B; interponitur. et quare
sic dicatur C interponatur et quare sic dicatur U
6 inveniri] incipere U si ... non] nisi BC 7 Notandum
igitur] Nota ergo B; Notandum ergo C 8 cesar] om C
sapientes] sapientes astronomi AccU 10 appellant]
appellant compotiste CU spacium] spacium temporis AccU
quantum] quantus A; quod C 11 assumit] consumit BccU
igitur] ergo AUC 14 triens autem] item triens BC
14-15 alicuius integri] alicuius integri divisi per tres
partes AccU 15 integri] tocies scilicet integri C ergo]
igitur AU 16 et] et ita C 17 hoc est] id est BC decies]
duodecies A 18 sic] ita BC dies] om U

trientibus. Bisse vero est due tercię alicuius integri
 divisi in tres partes equales. Triginta igitur bisse
 momenti faciunt xx momenta, hoc est medietatem hore; et
 cum sint xii signa, erunt xii medietates hore, id est sex
 cc329ra 5 hore integre. / Unde in toto anno habemus 365 dies
 et vi horas. Set quia difficile esset cuilibet anno istas
 sex horas continuare, ita quod nunquam in diem redacte,
 alicubi ponerentur; quia secundum hoc si annus precedens
 U45r incipiat a mane, secundus a meridie, tercius a
 B68v 10 / vespere, quartus a media nocte. Similiter festa
 sanctorum varientur; et ita principium ianuarii posset in
 Ba18ra tantum ascendere quod esset circa equinoc/tium
 vernale, vel ulterius, ita quod principium anni esset in
 tam longis diebus sicut sunt dies solsticii estivalis.
 15 Quare provisum est ut sex hore excrescentes in primo
 anno, et sex in secundo, et sex in tercio transferantur
 ad sex horas quarti anni. Et erunt in quarto anno 24
 hore, hoc est unus dies. Et sic particulariter collectus
 A110va interponatur / in februario, quia mensium

20

1 Bisse vero] item bisse BC tercię] tercię partes A
 2 igitur] ergo B; om C 3 xx] x C hoc est] id est BC
 medietatem] medietatem unus AU hore] om C 4 id est] et
 ita C 5 hore] om C unde] secundum hoc ergo C; per hoc
 ergo B; unde secundum hoc genus U 6 cuilibet] in
 cuilibet U 8 alicubi] alieni Acc quia] quod cc; et U
 si] om U 9 incipiat] incipit BC; inciperet AccU
 secundus] secundus inciperet U 10 Similiter] et
 similiter BC 11 varientur] variarentur AC; variantur B
 et ita] ita quod U 11-12 in tantum] om BC 13 vernale]
 hyemale cc vel ulterius ita] et C 14 sicut] sicut modo
 A sunt] om C 15 Quare] ideo C; om U ut] quod AccU
 16 et sex] vi C excrescentes] crescentes cc 18 hoc est]
 id est BC; et ita cc U dies] dies naturalis U et] om
 BC 19 interponatur] interponitur A; et interponitur B;
 ponitur U in] om B mensium] mensis U

U45v brevisissimus est. Et quia sex hore ex / quibus
colligitur iste dies proveniunt ex bisse momentis, iste
dies ex illis sex horis quater sumptis dicitur bisextus.
C34va Vel dicitur bisextus quia quando est annus bisextilis /
5 in ecclesiis cathedralibus legentes in Martilogio,
bis pronunciant sexto kalendas Martis, duos dies ponentes
super eadem litteram. Et sciendum quod cum duo dies ibi
computentur super eandem literam, sequenti die debet
celebrari festum Mathie. Unde versus:

10 Bisextum sexte Martis tenere kalende,
 Posteriori die celebrantur festa Mathie.

U46r / Ratio autem quare tali die bisextus interscaletur
est hec: senarius est primus numerus perfectus. Quia
igitur ille dies est quasi perfectio anni inponitur die

15

2 iste] ille U momenti] momentis Ba iste] iste autem
Acc; et iste BC 3 illis] istis C quater] quater qualis
B bisextus] bissextus. unde versus. Bissextus quartus
facit anno sex quater horis B; (verse in margin in C)
4 quia] vel sic U est] om C 5 in] est in C
6 pronunciant] pronunciat Ba martis] martii U
7 sciendum] nota BC 8 computentur] computantur BCU
sequenti] in sequenti C 9 festum] festum beati Acc;
sancti U 11 Posteriori] posteriore AccUB mathie]
mathie. Si bisextis erit .f. fuit utrique diebus C
12 interscaletur] intersecabitur A; interponitur BC
13 Senarius] Senarius enim U 14 igitur] ergo BC
perfectio] perfectissimus C inponitur] interponitur UBC;
imponitur Acc

denominato a numero perfecto. Perfectus autem numerus est
cuius partes multiplicatae et simul aggregate ipsum
numerum precise / perficiunt. Et hac ratione potest
dici quod interponitur in februario, quia dies februarii
5 sistunt in secundo numero perfecto, id est in 28. Utrum
autem sit annus bisextilis nec ne sic scitur: / sume
annos domini et divide in 4, et si aliquid sit residuum,
non est annus bisextilis; set illud residuum, sive sit
unitas, sive binarius, vel ternarius, manifestat annum
10 post bisextum. Si nichil sit residuum, presens annus est
bisextilis. Unde versus:

Tunc bisextus erit partes per $iiii^{or}$ equas,
Annos partiri cum poteris Domini.

Notandum etiam quod nisi observaretur bisextus, in 364
15 annis contingeret / diem natalis Domini in tam
longis diebus sicut modo celebratur annunciatio Domini.

1 denominato] denotato U a numero] anno cc autem om U
est] dicitur cc; dicatur C 1-5 perfectus ... numero
perfecto] om A 2 multiplicatae] aliquote simul sumpte
perficiunt ipsum perfectum ut .6. et .28. vel cuius
partes multiplicatione U et] om BCU
3 hac] hac eadem C 4 quod] quia ccC 5 sistunt]
consistunt B; sistant C id est .28.] scilicet in .28.
Acc; scilicet 28 U 6 autem] om B bisextilis] bisextus
B scitur] scietur Acc 7 domini] incarnationis domini B
divide] divide illos annos C in 4] per quatuor A; in
 $iiii$ partes equales C; per 4 partes equales B sit]
fuerit AccU; est BC non est annus bisextilis. Set illud
residuum] om Ba 8 non] tunc non U sive] om BC sit] est
C 9 vel] sive Acc manifestat] manifestant Ba;
manifestum C 10 Si] Set si U nichil] nichil est quod A
sit] est BC; fuerit U presens] primus U 14 Notandum
etiam] om etiam A; Item nota BC 364] 264 Ba 15 diem
natalis] natale BC domini] domini celebrari AUC;
dominica celebrari B; domini celebratum cc
16 celebratur] celebretur C; colebatur U domini]
dominica AU

U47r Quod sic patet: in tot enim annis, cum semper quartus sit
bisextilis, / contingunt 90 et unus dies, qui
numerus est quarta pars 364 dierum. Ex 90 igitur et uno
die possunt perfici 3 menses, duo 30 dierum et unus 31,
5 et isti tres menses sunt 4 pars anni; que si esset
ablata, contingeret predictum inconueniens, vel forte
peius, scilicet quod natale Domini celebraretur in tam
longis diebus sicut modo celebratur festum sancti
Johannis Baptiste; quod sic patet consideranti si
10 duplentur 364 anni.

A110vb Viso quid sit concurrens, quid bisextus, /
C34vb sequitur de ciclo solari, qui est quasi istorum /

1 sic] om Acc enim] om Acc semper] om U quartus]
quartus annus AccC 2 bisextilis] bisextilis ccU
contingunt] contingeret C; semper contingeret U unus]
cuius C 3 Ex 90] Ex 9 C; ex 90 dierum A ex 91 U 3-4
igitur et uno die] om U igitur ... et unus .31.] om A
duo 30 dierum et unus 31] om cc 5 menses] om A 6 ablata]
ablata id est non observatur B; ablata. et non observatur
C contingeret] contingeret cc inconueniens] inconueniens.
simile autem inconueniens est B; inconueniens simile
etiam inconueniens C forte] om C 7-8 in tam longis
diebus] om A modo] om B 8 sancti] beati Acc; om C
9 si] quia Acc 10 364] 264 Ba 11 quid] quid sit Acc
12 Sequitur] sequitur Capitulum 8 de ciclo solari B

Ba18va effectus. / Est igitur ciclus solaris revolutio
U47v temporis / in qua considerantur omnes variationes
que fiunt in anno solari per concurrentem et bisextum; et
repletur ille ciclus quando ultra septimanas integras
5 nichil est residuum de diebus illis qui excrescunt ultra
annum ebdomaticum (qui dies sunt causa concurrentium) nec
de sex horis excrescentibus singulis annis ultra dies
anni ex quibus horis proveniunt bisexti. Et illud spacium
est 28 annorum, quia in tanto tempore complentur iste
10 variationes, sicut patet depingenti tabulam
concurrentium. Cum autem sit ciclus quasi circulus, et
U48r in circulo contingit sumere principium ubicunque /
volueris, non est mirum si ciclus solaris secundum
diversos diversa habeat principia. Ciclus itaque noster
15 solaris secundum Dionisium et usum Ecclesie sumptus non
incipit ab eo anno quem nos et Gerlandus constituimus
principium set a duodecimi illius, ubi unitas est
concurrentis, sicut in primo anno, et F littera

1 igitur] enim B 1-8 revolutio temporis ... proveniunt
bisexti] om A (lacuna) 2 qua] quo BC 3 fiunt] sunt cc
4 repletur] tunc repletur B; tunc completur C; completur
ccU septimanas] septenarias Ba 6 annum ebdomaticum]
anni ebdomas C 6-7 concurrentium. nec de sex horis
excrescentibus] et residuum de excrescentibus vi horis B
8 bisexti] bisexti in iiiito anno BC illud] illuc A
9 complentur] complentur omnes AU iste] ille C
10-11 tabulam concurrentium] concurrentium et ciclum
solarem A; concurrentium cc 11 Cum autem] Si ergo C
12 contingit] contingat Acc sumere] sume C 13 volueris]
veletis C 13-14 non est mirum ... habeat principia] om
BC itaque] igitur Acc; om BCU 15 solaris] om U et] omC
16 anno] anno cicli C; anno cicli concurrentium B
17 principium] principium anni C; primum B

dominicalis, et est annus bisextilis. Unde patet quod
 B69r primus annus cicli solaris secundum Gerlandum xii /
 annis ante inicium cicli solaris secundum Dionisium
 incepit. Discretio autem cicli solaris secundum usum
 U48v 5 Ecclesie et Dionisium habetur per hos versus: /
 Ba18vb Fallitur Eva dolo, cibet, / Ade gaudia finit.
 Et cum botrus adhuc germinet, Eva dolet.
 Christus bella gerit, finitur eo duce bellum.
 Ad gravida fit dux, cuncta beavit ave.
 10 In hiis versibus sunt 28 dictiones servientes 28 annis
 cicli solaris, prima primo, secunda secundo et ita
 cc329va deinceps. Prima utilitas horum / versuum est ut
 C35ra sciatur que sit littera dominicalis. / Que enim
 littera est inchoativa alicuius dictionis, illa est
 15 dominicalis per totum annum cui deservit illa dictio,
 nisi sit bisextus. Si autem bisextus fuerit, tunc illa
 U49r littera est domini/calis per x menses, inicio sumpto
 a Martio, et littera que signatur extra fuit littera
 dominicalis fere per duos menses precedentes. Secunda
 20 utilitas est quod habita littera dominicali, per versus

1 annus] annus ille xiicim C; xiius B unde] ex hiis C;
 et ex hoc B 2-3 Gerlandum ... dionisium] om A
 3 dionisium] usum ecclesium et dionisium U 4 incepit]
 incipit AUBC 4-5 usum ecclesie] usum ecclesie et
 dionisium AU 5 habetur] habens C versus] versus. qui
 sic notificantur A 6 cibet] cibus CBU 7 Et] eta C 9 A
 gravida] Ad gravidam AUBC cuncta] cunta BC 11 ita] sic
 BC horum] istorum BC 13 dominicalis] dominicalis semper
 per duos menses precedentes C 13-15 Que enim littera est
 ... est dominicalis] om A 14 alicuius] om U 16 fuerit]
 sit BC 17 x] xii C menses] om C 18 signatur]
 significatur C 19 Secunda] Et secunda A 20 est] om Acc
 per versus] per dictiones. ut B; om U

statim scitur concurrens per hunc versum:

F, E, D, C, B, A, G, concurrentes posuere.

Quociens enim F est littera dominicalis, unitas est concurrens, quociens E binarius, et ita de aliis,

Allra 5 observato / ordine litterarum positarum in versu.

U49v / Tercia utilitas est ut sciatur utrum sit annus bisextilis. Sumantur igitur 28 anni computando in 7 digitis duarum manuum, ita ut primus annus cicli sit supra summitatem indicis unius manus, secundus in

Ba19ra 10 iunctura proxima, / tercius in alia, quartus in radice indicis, quintus in summitate medii digiti eiusdem manus, et ita descendendo donec ciclus compleatur. Dico igitur quod in 7 summitatibus sunt 7 anni bisextiles; qui sunt in iuncturis proximis ad summitates sunt anni primi

U50r 15 post bisextilium; et ita deinceps. / Hoc etiam scitur per tale abecedarium retrogradum G, F, E, D, C, B, A. Quociens enim in supradictis versibus transilitur ab aliqua littera illius abecedarii, tunc est annus bisextilis, et littera pertransita fuit litera dominicalis fere per duos

20

1 scitur] dictiones scitur] C; scietur U 2 posuere] posuere. id est. ordinavere BC 4 ita] sic C 5 positarum] posito Acc; ponitur C versu] versu. Unde alii versus. Sex habet a. b. quinque. c. iiii. d. tres habet que duos .f. unum g. quoque vii. C; ... b quinque tenet ... B 6 Tercia] Et tertia A 7 sumantur] sumatur C igitur] om AUB; ergo C 8 ita] om BC ut] quod AccU 9 supra summitatem] in summitate AUBC indicis] dicis cc; in digitis U unius] illius Ba 10 proxima] proxima illi summitati BC alia] media AccU 13 igitur] om A; ergo BC 13-14 qui sunt] qui vero sunt AccU; om B 14 proximis] proximus C 15 deinceps] de aliis BC 16 retrogradum] om Acc 17 enim] om BC ab aliqua] aliqua UBC; alia A 18 et] om c 19 littera] litera autem BC; litera vero ccU fuit] sit C; est U dominicalis] om Ba

menses, sicut dictum est. Litera consequens locum ubi factus est transitus fuit litera dominicalis per x menses. Potest etiam sic sciri an sit annus bisextilis per hoc versum:

5 Fallit amor cautos extant grave basia dantes.

In hoc versu sunt 7 dictiones servientes 7 annis

U50v

bisextilibus in toto ciclo. Cum igitur / primus annus cicli nostri sit bisextilis, prima dictio serviet primo anno, et fallit fallitur correspondet. Dictio vero

U51v

10 sequens hanc dictionem fallit incipiens ab A serviet

secundo bisexto et correspondet amor ade; et sic fiat per

cc329vb

ordinem. Hoc autem artificio possumus scire in quo anno /

Ba19rb

cicli sumus secundum Dionisium. Sume annos /

Domini et adde 9:

15 Nam solis decimo Christus nato fuit annus.

U51r

Illam totam summam divide per 28. / Facta igitur

c35rb

divisione, si nichil / est residuum tunc sumus in

ultimo anno cicli; si aliquid, illud residuum ostendit in

1 menses] menses initio sumpto a marcio U 3 etiam] autem BC an sit] auc fit C 5 extant] errant AccUC dantes] dentes AC 7 ciclo] anno Ba; uno ciclo A igitur] ergo BC 8 serviet] deserviet B; servit C 9 fallit] fallit decie B fallitur] et fallitur AU Dictio vero] Item dictio BC dictionem] dictionem .scilicet A 10 incipiens] incipiens est C; incipit B serviet] et serviet BC 11 sic] ita C 12 autem] om U quo] quoto AccBU 13 dionisium] dionisium et usum ecclesium U 15 Nam solis decimus christo nato fuit annus] Nam annus erat Xus solis luneque secundus quando Christus de sacra virgine natus U solis] ciclus BaBC Christo nato] Christus natus A annus] anno A 16 illam] et illam AU; postea illam C; posterea illam B totam] om U igitur] ergo B 18 aliquid] aliquid est residuum C illud residuum] illuc A; illud ccU; est residuum. residuum B ostendit] ostendet A

quoto anno ciclus sumus.

A111rb

Sequitur de anni divisione. Dividitur autem /

annus in iiii^{or} partes, ver, estatem, autumpnum et hiemem.

Ver dicitur a vireo vires quia tunc omnia virent; Estas

5 ab estu; autumpnus ab autumos, quodam Greco cuius

equipollens apud nos idem sonat quod morbidum vel

tempestuosum, et hoc quia illud tempus est frigidum et

siccum. Hyemps dicitur ab emi quod est dimidium, quia

vulgus dividit annum in hiemem et estatem, large

U51v

10 appellens hiemem anni medie/tatem. Harum parcium

principia et terminationes possunt haberi per hos versus:

Festum Clementis capud est hiemis orientis,

Cedit hiemps retro cathedrato Symone Petro,

Ver fugat Urbanis estatem Symphorianus.

15 Habet autem tam estas quam autumpnus 91 dies, hiemps 92

dies propter illum diem excrescentem ultra annum divisum

per 4 partes. Ver autem habebit 92 dies si sit bisextus,

B69v

/ sinon autem 91 diem. In versibus quidem predictis

1 sumus] sumus sine dubio B 2 autem] enim C et] om AU
3 ver dicitur] dicitur autem ver BC vires] res BCU
virent] virent et florent BC 5 Estas] Estas dicitur BC;
Estas autem dicitur U estu] estas cc Autumpnus]
Autumpnus dicitur BC ab autumos] a Ba 6 idem sonat] est
idem BC vel] et U 7 hoc] hoc est U illud] illuc A
8 hyemps] hiems autem A emi] yemi U 9 annum] totum
annum cc hiemem] hiemem scilicet BC 10 harum] harum
autem BC 12-14 Festum clementis ... symphorianus] ver
petro detur. estas exinde sequitur. hanc dabit urbanus.
Autumpnum simphorianus. Festum [finit U] clementis hiemis
capud est orientis AccU 15 dies] diem C hiemps] hiemps
vero AccU 16 illum] illum unum C; illam U 17 partes]
septimanas U autem] om AccU 92] 9 et duos C bisextus]
annus bisextilis BC 18 autem] om B diem] om BCU In
versibus quidem predictis] tribus autem predictis
versibus BC; om quidem AccU

Ba19va si non assignentur cuilibet parti tot dies quot /
 iam in assignando diximus, hoc ideo contingit quia
 terminationes et principia predictorum parcium per festa
 U52r notata volunt notificari: non / constituatur vis in
 5 hoc, si unus dies vel duo dies unius partis computentur
 cum diebus alterius partis. In hiis 4^{or} anni temporibus
 sive anni partibus sunt duo solsticia et duo equinoctia.
 Dicitur autem solsticia non quia sol aliquando stet sed
 quia est in maximo accessu ad cenith capitis nostri, vel
 10 iterum in maximo recessu ad cenith capitis nostri.
 Equinoctium vero dicitur quando dies artificialis
 adequatur nocti. In quibus signis contingunt solsticia et
 equinoctia patet per hos versus:
End Hec duo solsticia faciunt Cancer Capricornus,
 cc329vb 15 Set noctes equant Aries et Libra diebus. /
 U52v Solsticium estivale est circa principium Cancrī, /
 quoniam tunc maxime sol accedit ad cenith capiti nostri

1 assignentur] assignetur AccC 2 iam in] om BC hoc ideo
 contingit] hoc ideo diximus. hoc ideo contingit A om
 ideo C 4 notata] nota BC; Ba; notabilia U volunt
 notificari] volumus notificare. et non sunt festa alia
 notabiliora hiis et [om et C] propinquiora. ideo sunt
 principia et terminationes ab hiis BC non] non igitur
 AccU 4-5 constituitur vis in hoc] constituit vim in hoc
 B; constituentes in hoc vim 5 dies] om BC computentur]
 computerentur C 6 anni temporibus] partes Acc;
 temporibus BC 8 quia] quia tunc AccU 9 accessu ...
 capitis nostri] accessu vel etiam maxime recessu ad
 cenith capitis nostri .scilicet. centrum emisperii B
 10 iterum] etiam C ad cenith capitis nostri om C
 11 vero] autem BC dies artificialis] dies estivalis
 cc;dies nocti B; nox C 12 nocti] artificialis B; diei
 artificiali C quibus] quibus autem BC 15 Set] Terque cc
 equant] equat 17 quoniam] quia A

vel ad nostram habitabilem. Solsticium hiemale est circa
 All1va principium Capricorni, quoniam tunc sol maxime recedit /
 a cenith capitis nostri sive a nostra
 habitabili. Quando autem sol recedens a Capricorno
 C35va 5 / versus Cancrum venit ad locum medium inter
 Capricornum et Cancrum, tunc est equinoctium, et quia
 contingit in vere dicitur equinoctium vernale, in Marcio
 Ba19vb circa principium Arie/tis. Quando vero sol recedit
 a Cancro tendens versus Capricornum venit ad locum medium
 10 inter Cancrum et Capricornum, tunc est aliud equinoctium,
 U53r et quia contingit in autumpno / dicitur equinoctium
 autumpnale, in Septembri circa principium et introitum
 solis in Libram. De certis autem diebus solsticiorum et
 equinoctorum dubium est. Dicunt tamen computiste quod sol
 15 intrat novum signum xv kalendas mensium. Unde versus:

Semper quindenis ponuntur signa kalendis.
 et octavo die post debet equinoctium intrare vel

1 vel] sive AU habitabilem] habitabilem zonam BC;
 habitabile U 2 quoniam] quia A nostra] nostro AU;
 4 habitabili] habitabili zona B Quando autem] Item
 quando BC recedens] cedit C recedit U 5 venit] et venit
 B 6 tunc] et tunc AU; om BC 7 dicitur] hic dicitur B
 ideo dicitur C equinoctium] om C in marcio] in marcio
 scilicet AU; hoc est BC 8 principium] principium et
 introitum U arietis] solis in arietem AU Quando vero]
 Item quando C 9 versus] ad BC venit] et venit BC 10 et
 capricornum] om C tunc] et tunc AU 11 dicitur] ideo
 dicitur BCU 12 septembri] septembre scilicet A;
 septembri scilicet BCU et introitum] introitus B; et
 introitus C 13 certis autem] cunctis quidem A 14 dubium
 est] dubium est apud modernos A tamen] autem BC
 15 mensium] mensis AU 15-16 unde versus ... signa
 kalendis] om BC 17 intrare] esse] AUBC vel] et BC

U53v

solstitium. Unde patet quod cum sol intret Capricornum 15 kalendas Ianuarii, et octavo die post debeat esse solsticium, erit solsticium hiemale in die natalis Domini, octavo kalendas Ianuarii. Similiter cum sol 5 intrat Cancrum xv kalendas Iulii erit solsticium estivale in die natalis beati Johannis Baptiste, viii° kalendas Iulii. Similiter patet de equinoctiis: / cum sol intret Arietem 15 kalendas Aprilis erit equinoctium vernale ubi annunciatio Domini notatur, scilicet viii° 10 kalendas Aprilis; cum iterum sol intret Libram 15 kalendas Octobris erit equinoctium autumpnale in die conceptionis beate Johannis Baptiste, scilicet viii° kalendas Octobris. Quod autem solsticium fuerit hiemale in nativitate Domini, solsticium estivale in nativitate

15

1-3 unde patet ... solsticium] om U 1 unde] ex iam dictis ergo BC intret] iam intrat B 2-3 debeat esse solsticium erit] debet A 3 natalis] nativitatis B 4 domini] domini scilicet AUBC 5 intrat] intret AC 6 die natalis] die nativitatis AB; festo U beati] om BC 6 viii°] scilicet 8 AU 7 Similiter patet de equinoctiis] Similiter est equinoctium ubi annunciato notatur dominica scilicet viii kalendas aprilis A patet] om BCU 8 intret] intrat in C; intrat U 9 domini] dominica ABU 10 Cum iterum] Item cum BC intret] intrat CU 11-12 in die ... scilicet] om BaBC 14 nativitate] die natale U solsticium] et solsticium AU; om BC nativitate] die U

Ba20ra beati Johannis / Baptiste, videtur probari hac
auctoritate Mathei de beato Johanne: Illum oportet
crescere me autem minui; quia dicit quedam glosa quando
A111vb Dominus natus erat dies incipiebant crescere, /
U54r 5 quando autem Iohannes decrescere. Set licet tunc
hoc fuerit verum, in nostro tamen tempore non est ita,
quia recesserunt equinoctia et solstitia per hoc quod
attribuimus cursui solis plus temporis quam deberet
attribui, quantum enim ad veritatem sol moratur in
10 quolibet signo per 30 gradus et 30 trientes hore et 29
bisse momenti. Unde in quolibet signo computamus
superflue unum bisse, et cum xii sunt signa, erunt xii
bisse momenti, que valent 8 momenta, id est quintam partem
hore. Et ita in 5 annis computamus superflue unam horam.
U54v 15 Et cum 24 hore faciunt unum diem naturalem, / in

1 beati] sancti BU 1-3 videtur probari ... minui] om C
videtur probari] sic patet A; videtur U hac] om AU
2 mathei de beati Johanne] beati mathei de beati Johanne
A; om B Johanne] Johanne qui dicit U 3 minui] minui.
hec sunt verba beati johannis baptiste B quia dicit]
dicit enim ibi AU; ubi dicit BC glosa] glosa super hoc
quod C; glosa quod] AUB quando] cum BC 4 erat] est B;
esset C incipiebant] incipiebat A 5 quando] cum U
iohannes] Johannes natus erat incipiebant U set] et Ba;
om AU tunc] om Ba 6 verum] tempus verum C; temporis
verum B 7 recesserunt] retrocesserunt U 8 temporis]
tempore C 10 per] om U 29] per 30 B 11 signo] anno B;
anno superflue C computamus] computatur C; computantur B
12 unum bisse ... erunt] om BC 13 id est] et id est U
14 hore] unius hore BCU

2-3 Ioan. 3,30 3 Biblia sacra (Lugd.1520) fol. 196v

quinquies 24 annis invenitur superflue unus dies
naturalis, id est in 120 annis. Set a nativitate Domini
elapsi sunt 1200 annis et eo amplius, in quo numero sunt
C35vb decies centum et decies viginti; / et ita per decem
5 dies recessit iam solsticium hiemale a nativitate Domini,
et estivale a nativitate beati Iohannis Baptiste.
Ba20rb Similiter intelligendum est de equinoctiis. Unde /
versus:

Solsticium x Christum preit atque Iohannem,
10 Nuncia sic matris nox equa diemque Iohannis.
Notandum etiam quod quolibet quatuor temporum est quoddam
ieiunium trium dierum. Jeiunamus enim in vere quia tunc
omnia virent, ut in nobis vireant virtutum opera; vel ut
U55r in nobis temperetur humor ille qui assi/milatur /
B70r 15 veri, scilicet sanguis, qui est calidus et humidus.
Jeiunamus etiam in estate ut simus ferventes in caritate;
vel ut in nobis temperetur humor ille qui assimilatur
estati, scilicet colera, que est calida et sicca.
Jeiunamus in autumpno ut in nobis proveniat fructus
20 bonorum operum; vel ut in nobis temperetur ille humor qui
assimilatur autumpno, scilicet melancolia, que est

1 invenitur] innumeratur B; numeratur C 2 id est] om BC
3 elapsi] lapsi U 4 decies viginti] 2 B; viginti U
5 recessit] retrocessit AUBC 6 estivale] solsticium
estivale BC beati] om C; sancti U 9 x] decimo scilicet
die B 10 Nuncia] et nuncia U sic] sicut B diemque]
dies que BC 11 Notandum etiam] om etiam A; Item nota BC
12 in] om BA quia] ut sicut AU 13 virent] virent et
florent AU ut] ita AC; sic U 16 Jeiunamus etiam] Item
ieiunamus BC ferventes] ferventes amore domini C
19 Jejunamus] Jejunamus iterum A; Item jejunamus BC
proveniat] veniant B 20 ut om U

A112ra frigida et sicca. / Jeiunamus itaque in hieme ut
sicut defluunt folia et moriuntur herbe, ita in nobis
morianatur vicia et defluant; vel ut in nobis ille humor
U55v temperetur qui assimilatur hieme fleuma, scilicet, /
5 quod est frigidum et humidum. Quibus autem diebus ista
ieiunia debent celebrari scitur his versibus:

Dat crux Lucia cineres carismata dia,
Ut sit in angaria quarta sequens feria.

Quoniam vigilie quorundam apostolorum habent ieiunium ex
Ba20va 10 institutione, quorundam / non, que habent et que
non, scitur per hos versus:

Petrus et Andreas, Paulus cum Simone Iudas,
Ut ieiunemus nos admonet atque Matheus.

Sunt autem sex apostoli vigilias habentes, set tantum
15 quatuor habent dies in quibus ieiunamus, quoniam duo
U56r apostoli habent unum diem, Petrus scilicet / et
Paulus, alii duo unum diem, scilicet Symon et Iudas,

1 Jejunamus itaque] Item ieiunamus BC; om itaque U
2 defluunt folia et moriuntur herbe] tunc folia moriuntur
et herbe B; folia fluunt tunc et moriuntur herbe C;
defluunt folia ab arboribus et moriuntur herbe AU
3 defluant] et a nobis defluant A; defluunt B vel ut]
sive C; om ut U 5 frigidum et humidum] frigida et humida
C; frigidus et humidum B 6 ieunia] om U debent] debeant
C scitur hiis versibus] scitur per hos versus A; per hos
versus sciri potest B; patet per hos versus C; dicunt
scitur hiis versibus U 7 cineres] cineresque 8 feria]
feria. angaria .id est. abstinentia B 9 Quoniam] Item
quoniam BCU vigilie] om A ieiunium] ieiunari B; C
10 quorundam] quorundam autem BC habent] habent ieiunari
B habent ieiunium C et] om C 11 scitur] patet B per
hos versus] hiis versibus CU 14 habentes] habentes in
quibus ieiunatur AU; quibus ieiunamus C tantum] tamen B
15 in quibus ieiunamus] ieiuniis institutos AU; om in C
quoniam] quoniam cum B 16 diem] om C petrus] p C
scilicet] sicut U alii] alii autem A; et alii B diem]
om AU BC

Andreas unum, Matheus unum. Si autem scire velis quare in
vigiliis aliorum apostolorum non ieiunamus, in Summa
A112rb magistri Johannis Beleth plenius invenitur. /
U57r Quoniam autem adventus Domini variatur per litteras
5 dominicales et feriales que considerantur in anno solari
ad habendum certum diem adventus domini sciantur hii
versus:

1 Matheus unum] om A; et Matheus unum U velis] vis C 2
ieiunamus] ieiunatur A; ieiunemus BC 3 beleth] belet CU
plenius] plene C invenitur] invenies B; invenietur C; AU
add: sed quia tamen [om tamen U] quibusdam [U add causam]
audire placet sciendum quod in vigilie aliorum
apostolorum non instituit ecclesia ieiunare propter
impedimenta. Mathias [U add autem] ieiunium non habet
institutum quia festum eius semper [om semper U] fere
contingit in quadragesima. vel quia non fuit de primis
apostolis. set post mortem [U add inde] sortitus est [U
adds apostolatum] vigilia philippi et jacobi inter pascha
et pentecoste. scilicet kalendas maii non ieiunamus [56vU]
quia tunc est tempus jocunditas et [om jocunditatis et U]
letitie. Barnabas non habet ieiunium quia non sunt [fuit
U] de numero 12. Jacobus occisus fuit [U add in hispania]
ab Herode in festa pascha. quare nec festum eius nec
ieiunium potuit celebrari. [U adds set] festum illius
.viii. kalendas [112rbA] augusti est [celebratur U]. quia
tunc [U add tali die] dedicata est [fuit U] ei ecclesia
in hispania. U add Item] vigilie [om beati U] bartholomei
non ieiunatur quia uno die excoriatus fuit [excoriatur
U]. et die sequenti obiit. et sic esset in tertia die si
haberet ieiunium ante obitum quod esset contra
institutionem. [U add In] vigilie beati thome non
instituitur [U adds ieiunium] quia festum eius [57rU]
semper est in adventu domini ubi continuum [constitutum
A] instituitur ieiunium. festum beati johannis baptiste
est tertia die post natale domini. Unde propter
excellentiam festi non ieiunatur. AU 4 Quoniam autem]
Item quoniam BC 5 et feriales] om AU; et ferias C anno]
ciclo U 6 certum diem] certitudinem A domini om A hii]
isti AUB

Cf. Johannis Beleth, De ecclesiasticis officiis (CC.
Cont. Med. XLI A) 26-27

Andree festo vicinior ordine quovis,

Adventum Domini prima colit feria.

Si cadet in lucem Domini celebratur ibidem.

C36ra / Et sic breviter patet ubi adventus Domini semper
5 celebretur.

U57v / Sequitur de anno lunari. Est autem quadruplex. Primus
firmamenti rediens iterum ad idem. Secundus est idem quod
10 lunatio paulo maior primo. Tercius est spacium xii
lunationum qui dicitur annus communis. Quartus est
spacium xiii lunationum qui dicitur embolismalis. De hiis
Ba20vb communiter age/tur per ordinem. Primus igitur
annus continet in se 27 dies et 8 horas, quod sic patet:
15 luna moratur in quolibet signo per duos dies et 6 horas
et bisse hore. Ex eo quod moratur in quolibet signo per
duos dies, et xii sunt signa, habemus duodecies duos
dies, id est 24 dies. Ex eo iterum quod moratur per 6

1-3 andree festo ... celebratur ibidem] tres precedentes
andreeque [andreas C] tresque sequentes. addeque [andreeque
C] dies. adventus sit trilunies in hiis .vii. diebus iam
nominatis et continue sumptis. unus illorum [B add de
necessitate] sit dies [om dies B] dominicus in eo
celebrabitur [celebratur B] domini adventus BC
7 Capitulum 10 de anno lunari B Sequitur] 11 Sequitur U
autem quadruplex] igitur quadruplex annus lunaris AU
primus] primus annus BC; primum U 8 enim] om BC
spacium] spacium temporis AU 9 firmamenti] firmamenti
proprio motu A; zodiaci C Secundus] Secundus annus B
10 xii] xiii A; 13 U 11 annus communis] embolis A;
embolismalis U 11-13 Quartus est ... per ordinem] om AU
13 communiter agetur] agemus B; autem agimus C 15 Luna]
quia luna U 16 Ex eo] ex eo igitur AU 17 et xii sunt]
cum xii sint BC 18 id est] om AU dies] om B Ex eo
iterum] Item ex eo BC; ex eo U

horas erunt 3 dies. xii vero bisse hore sunt 8 hore
 integre. Et ita habemus in universo dum luna circuit
 zodiacum, ab uno puncto exiens et rediens ad idem,
 U58r transac/ti sunt 27 dies et viii hore. /
 A112va 5 Secundus annus est illud spacium quo luna semel accensa a
 sole peragrat circulum suum, rediens ad idem punctum ubi
 accensa fuit; set cum ibi solem non invenit, quia fere
 sol processit per unum signum, attingit solem spacio
 duorum dierum et 4 horarum. Unde iste autem annus habet
 10 in se 29 dies et 12 horas, propter duos dies et 4 horas
 adiectas primo anno; et est idem iste annus quod lunatio,
 sive mensis lunaris. Ex predictis patet quod quelibet
 lunatio est 29 dierum et 12 horarum, set cum ita non
 computat compotista immo, 12 horas unius lunationis
 15 transfertur ad 12 horas alterius lunationis, computans
 Ba21ra lunationem / un/am 30 dierum, reliquam 29.
 U58v Set hoc quandoque impeditur per bisextum, per embolismum,

1 xii vero] Duodecim autem A; duodecim U; Item xii BC
 23 2 dum] quod dum BC 3 exiens et] om AU; ab uno puncto
 C 5 Secundus] Item secundus U illud] illuc A spacium]
 spacium temporis U quo] in quo A; quod C 6 idem] eundem
 B 7 ibi] om U invenit] inveniatur BCU 7-8 fere sol] iam
 sol fere B; sol fere iterum U 8 attingit] ipsa attinget
 AU; luna attingit B; ipsa luna contigit C spacio] per
 spacium BC 9 Unde iste] iste autem A; unde ille B
 10 et] om U propter duos dies et 4 horas] om A 4] 8 Ba
 11 iste] ille BC 12 quelibet] om C 13 est] constat
 naturaliter ex BC dierum] diebus BC horarum] horis BC
 cum ita] ita tamen ABU; om cum C; 14 compotista] vulgi
 B; vulgus C 15 transfertur] transfert BCU 16 unam]
 super unam A reliquam] et reliquam AUBC 17 per]
 propter B per] et propter B; et per C per] et BC

per saltum lune. Cum igitur una lunatio sit 30 dierum,
alia 29 secundum comptiste computationem, lunatio parium
dierum / attribuitur mensi impari. Unde versus:

B70v

Impar luna pare, par fiet impare mense.

5 Lunatio iterum dicitur esse illius mensis in quo
terminatur. Unde versus:

cc330ra

/ Mensi luna datur cui fine suo sociatur.

Si autem due lunationes terminentur in uno mense, altera

U59r

illarum erit irregularis, scilicet embolismalis, id est /

10 hoc fiet mediante embolismo. Isti versus iam dicti habent
instanciam per bisextum et embolismum. Qualiter

C36rb

bisextus / impedit sic patet: regula est quod

semper in anno bisextili lunatio februarii erit 30

dierum, in aliis annis 29; et hoc est propter unum diem

15 excrescentem in bisexto. Unde in anno bisextili erunt 3

lunationes continue 30 dierum, Januarii, Februarii et

Martii. Notandum etiam quod quociens lunatio Marcis

1 Cum igitur] Cum ergo A; Item cum C sit] debeat esse BC
2 alia] et alia A 29] 29 dierum AU comptiste] vulgi BC
3 impari] impari [imparis C] in dispositione ordinationis
kalendarii et econtra scilicet impari lunatio attribuitur
mensi pari BC; impari et lunatio imparium dierum
attribuitur mensi pari U 4 impare] in impare A; in
impari BC 4-7 Impar ... sociatur] Impar luna pare, par
fiet impare mense. Mensi luna datur cui fine sociatur.
Lunatio iterum dicitur esse illius mensis in quo
terminatur. Unde versus precedens Ba 9 illarum] earum
BCU 9 scilicet] id est BC hoc] vel hoc BC 10 Isti]
Isti duo BC; versus] versi U 11 et] et per A; per cc
qualiter] et qualiter U 12 impedit] impediatur BCU;
impediatur A regula] regulare Ba; regula enim AU; quia
regula C quod] om B in] cum sit in BC 14 hoc est
propter] propter hoc AB 16 dierum] dierum scilicet AU BC
17 Notandum etiam] Et nota B; Et notandum C

incipit ante locum bisexti, et si sit annus bisextilis,
videtur duplex inconueniens contingere: quod lunatio

- A112vb Martis scilicet habeat 31 dies, / quod est
U59v inauditum, et quod lunatio Fe/bruarii sit tantum 29
Ba21rb 5 dierum, quod est contra regulam iam datam. Ad /
hoc solvendum, nota quod in tali casu ubi lunatio Martis
deberet pronunciari prima, lunatio Februarii
pronunciabitur trecesima, ita quod numerus signans
primationem lunationis Martis intelligatur poni in
10 secundo loco. Hoc etiam notatur in quibusdam
kalendariis per quendam numerum extra scriptum ab
octavo ydus Februarii usque ad locum bisexti, ita quod 16
scribatur extra contra septimum idus, quinque autem
contra 6 idus, et sic descendendo usque ad locum bisexti.
U60r 15 Hoc autem solet notari quibusdam lineis / oblique
protractis ab eisdem locis usque ad locum bisexti. Ad
habendum quidem etatem lune singulis diebus, id est
tempus post accensionem eius a sole, primo inueniebantur
tabule a Romanis; deinde Caldei inueniunt aureum numerum

20

1 incipit] incipit esse BC; incipiat U bisexti]
bisextilem U et] om U si] om BC 3 habeat] habet AU;
habeat BC dies] dierum AccB 4 sit] est BC 5 iam] om U
datam] dictam BC 6 quod] est C quod] quod semper BC
7 deberet] debet U 8 trecesima] xxx dierum C; 30 dierum
U ita quod] et ita A signans] designans AccU 9
primationem lunationis] primam lunationem BC 11 quendam]
quendam qualis B 10-11 ab octavo ydus] a tercio nonarum]
U; a tercio nonas BC; ab octavo idus BA 11-12 ab octavo
ydus ... locum bisexti] om A 12 quod] om U 16] 19 AUBC
13 septimum idus] pridie nonas februarii AUBC 13-14
quinque autem contra .6.idus] autem contra nonas AUBC 15
hoc autem] hoc etiam AccU; et hoc etiam BC quibusdam] in
quibusdam kalendariis U 16 eisdem locis] eis locis usque
ad locum bisexti A 17 quidem] AUBC diebus] annis A id
est] et B 18 inueniebantur] inueniunt sunt] BC 19
inueniunt] inueniunt AUBC

et Romam miserunt. Romani igitur numerum illum propter
eius facilitatem et utilitatem aureis litteris
kalendariis suis scripserunt; unde adhuc appellatur
aureus numerus. In primo igitur anno cicli decennovenalis
5 per totum kalendarium primationes notantur per unitatem,
secundo per binarium et sic de aliis. Ex hoc patet quod
U60v cum iste ciclus / contineat 19 annos in numeris
predictis, maximus numerus erit 19. Ponitur igitur in
principio Ianuarii ternarius, quoniam de necessitate
10 contingit ita, quod quando sumus in tercio anno istius
Ba21va cicli / semper in prima die Ianuarii luna erit
cc330rb prima. / Ab isto numero formantur alii numeri
sequentes per additionem 8, ita tamen quod si excrescat
maior numerus quam 19, reiectis 19 residuum sumatur. Vel
15 sic formetur: si numerus propositus fuerit 12 vel maior
numerus, subtrahuntur undecim et residuum ponatur loco
U61r sequenti, si autem minor quam xii ad/de viii. In

1 romam] romanis Acc igitur] ergo BC 1-2 numerum illum
propter eius facilitatem] propter illius numeri
facilitatem BC 3 kalendariis suis] in kalendariis A; in
suis kalendariis B scripserunt] inscripserunt U unde]
unde et BC 4 igitur] ergo BC 6 secundo] in secundo ABU;
notatur in secundo C sic de aliis] sic deinceps AccU
Ex] et U quod] om U 7 cum] om A contineat] contineat
tantum BC; continet BaAU 8 predictis] iam dictis BC
maximus] om C numerus erit 19] xixlis B ponitur]
ponatur C igitur] ergo BC 10 istius] huius A 11 prima]
primus cc primo U luna] lunatio BC isto] isto quidem
AccU 12 alii numeri] om A; numeri ccUBC AU numeri] om
AUBC ita] om C 13 excrescat] crescat A 14 numerus] om B
quam] om Ba reiectes] relictis BCU vel] unde Ba; om C
15 formetur] formetur numerus sequens apereunti Acc;
formatur numerus sequens U propositus] positus A;
precedens U fuerit] sit BC maior numerus] maior AUBC 16
subtrahantur] subtrahatur C; abiciantur AU undecim] om U
16-17 loco sequenti] om Ba; sequenti loco B; in sequenti
loco C; pro numero sequenti ccU autem] om AU; autem sit
B minor quam xii] maior quam xi cc adde] addantur AU

aureo quidem numero fere per totum kalendarium minor
A113ra numerus sequitur maiorem immediate, / vel maior
C36va minorem mediate. / Istud autem habet instanciam in
xii locis in kalendario, ita quod in vi locis iuxta
5 principia vi mensium signatorum pari numero, ut secundo,
4°, etcetera. Relique vi instancie sunt iuxta finem vi
mensium continue sumptorum, habito initio a iulio. Quod
totum patet per hos versus:

Aureus hac arte numerus formatur aperte:

10 Prima dies Iani que ianua dicitur anni,
U61v Ternarium re/tinet ne posterus ordo vacillet;
Per precedentem numerum dant octo sequentem.
Si decimum nonum superabit sic numerando,
Tolle decem pariter novem reliquum retinendo;
15 Si duodenarius numerus tibi venerit aut plus,
Undenas tollas et quod super est ibi ponas.
Si duodenario numerus fuerit minor illi,
Octo coniungas, coniunctum postea scribas.

1 quidem] autem A; om BCU fere] Item fere B 2 sequitur]
sequetur Ba vel] om A; et BC 3 mediate] mediatem A
autem] tamen AUBC instanciam] instanciam in kalendaris
C 4 in] om B in kalendario ita quod] om C quod] ut B
6 4°] et iiiio BC et cetera] et sic de aliis habito
initio scilicet a februario et post ab aprili et sic
semper transiliendo unum mensem usque ad finem kalendaris
B vi] vero AU 8 patet] potest patere A; patet patet U
per hos versus] hiis versibus ABC 9-10 Aureus hac arte
... dicitur anni] U reverses first two lines. 10 Prima
dies] principium B; principium anni C que] qua B
12-14 Per precedentem ... reliquum retinendo] scito per
hanc artem numerum formare sequentem BC 13 superabit]
superabis Acc 14 pariter] pariterque U 15 tibi] sibi C
venerit] provenit B 16 undenas] undenis AU; undena cc;
undenos C 17-18 illi octo] octo huic numero BC
18 coniungas] iungas ccBC

Ba21vb Maiori numero debetur tercius ordo; /
 Si minor assequitur, maiori continuatur.
 Per loca bisseña non est hec regula firma:
 Tres Februi quarto nonarum continuato;
 5 Quatuor apponas sub Aprilis pridie nonas;
 U62r Tot Iunius lacerat ubi nonas iiii^{or} aptat; /
 B71r August/i capite 3 debes continuare;
 Quatuor Octobris lateratim pone kalendas;
 In quartis nonis duodeni denique mensis;
 10 Linea tredecimum tenet una simul que secundum.
 Excipe 6 menses, Iulium prius atque sequentes,
 Hiis quamvis crescat undenis summa propinquat
 Octo, minor numerus, sequitur nec continuatur.
 Tali quippe modo describitur aureus ordo.
 15 Notandum quod ciclus decennovenalis et ciclus lunaris
 eiusdem sunt quantitatis, quia uterque est 19 annorum,
 set in hoc differunt, quod ciclus decennovenalis noster
 U62v prius incepit scilicet / duobus annis, quoniam
 A113rb primus annus / cicli lunaris est in tercio

20

2 continuatur] continuetur C 5 aprilis] aprili C
 6 iunius] iulius U lacerat] laceras cc ubi] ibi Ba
 aptat] aptas U 8 lateratim] lateratum U kalendas]
 kalendis AUBC 10 tredecimum] om C [lacuna]; tresdecim C
 una] om A simulque] simul quod Ba secundum] secundo AC;
 secundum id est una linea debet continere duos numeros
 scilicet xiii et ii in principio decembris B 12 undenis]
 undenus Ba propinquat] propincat C 13 continuatur]
 continuatur id est quanvis maior numerus sequitur minorem
 ut xix sequi[tur] xi debet ei immediate continuari et
 minor numerus sequi debet [maio]rem] C 15 Notandum quod]
 Item nota BC 16 uterque] utrique A est] om A 17 quod]
 quia U incepit] incipit BCU 18 duobus] tribus AUBC
 Quoniam] om U 19 lunaris] solaris cc tertio] quarto
 AUBC

cc330va / anno cicli decennovenalis. Est autem ciclus
decennovenalis secundum quem procedimus primationes
lunationum assignando et cui deservit aureus numerus in
kalendariis nostris scriptus. Ciclus autem lunaris est
5 secundum quem veteres Romani procedebant assignando veras
ascensiones lune per multiplicem laborem multiplicationis
et divisionis, et solet notari in quibusdam kalendariis
C36vb per quendam numerum posita unitate in kalendis /
Ba22ra Ianuarii, deinde facta formatio/ne ad modum aurei
10 numeri per additionem 8; et ita uterque ciclus incipit a
U63r ianuario. / Si autem velis scire in quoto anno cicli
decennovenalis sumus, annis Domini adde unitatem et totum
divide per 19 annos, et si nichil est residuum tunc sumus
in ultimo anno illius cicli; si aliquid, illud ostendet
15 in quoto anno sumus. Si in quoto anno lunaris cicli sumus
scire velis ab annis Domini subtrahe duo vel adde 17 et

1-2 Est autem ciclus decennovenalis] om C 3 in] om U
4 nostris] om BC ciclus] circulus C est] est ille BC;
om U 15 procedebant] Ba adds Tali quippe modo
assignando] primationes assignando et U veras] om C
17 notari] poni A; annotari BC kalendariis] kalendariis
veteribus AUBC 8 posita] om C unitate] in unitate A
kalendis] kalendam A 9 modum] modi C 10 8] vii C
11 ianuario] principio ianuarii BC autem] om Acc velis]
vis B 12 et] om C 13 est] sit A; fuerit U tunc] om BC
14 illius] ipsius Acc; om U aliquid] aliquid est
residuum BC illud] illuc A ostendet] ostendit B
15 anno] anno cicli AB si] si vero AccU; si autem BC
16 duo] unum cc; duas unitates B; duos C 17] 18 Acc

divide ut prius.

Sequitur de tercio anno lunari, scilicet de anno
communi. Et dicitur communis quia habet 12 lunationes
sicut annus solaris 12 menses; vel quia fere contingit
5 quod semper duo anni communes simul conveniunt, ut
patebit in collatione embolismorum. Iste autem annus
U63v continet in se 354 dies, quod patet ex hoc, / quod
habet 6 lunationes 30 dierum in anni communi et alias 6
29 dierum, que summa dierum est 354. Patet etiam quod
10 annus solaris excedit hunc annum communem spacio xi
dierum; unde si ille duo anni simul incipiant, prius

1 divide] deinde Acc prius] BC add Item nota quod
punctus prout sumatur in tempore est quinta pars hore
unde [unde et C] quinque puncta faciunt unam horam.
quando autem luna est prima de nocte lucet per iiiior
puncta. quando vero secunda per .viii. puncta. id est
unam horam et tria puncta [ix. puncta et .i. horam et
.iii. puncta C] et sic semper crescendo singulis diebus
.iiii. puncta superaddantur. in decrescendo vero singulis
diebus. iii. puncta diminuunt. luna vero .xv. lucet per
.xii. horas. Set xxx utpote soli supposita nihil lucet.
Si vero vis scire quot horis luna luceat singulis
noctibus sumatur etas lune et si fuerit minor quam xv
totalis numerus multiplicetur per .iiii. postea productum
dividatur per v et numerus exiens fuit quotiens designat
quot horis luna luceat. si quid fuerit residuum [C adds
de numero dividendo quantum fuerit residuum] tot notabit
partes unius hore scilicet puncta. si vero luna fuerit
maior quam xv [x C] dies consideretur differentia illius
numeri sive distancia ad .xxx. et illa differentia
multiplicetur per iiiior et dividatur productum per .v.
ut prius et habebis horas et puncta horarum si quid
fuerit residuum de numero dividendo. 2 lunari] lunari
[cap] 12 U 3 dicitur] dicitur annus iste AccU; dicitur
annus B 3-4 lunationes sicut] menses lunares quemadmodum
Acc; lunationes quemadmodum U 4 vel] et BC 5 conveniunt]
eveniunt Accu; veniunt BC 6 patebit] om U collatione]
collectione AUBC 6-7 Iste autem annus continet in se]
habet autem annus iste A Iste] ille C 7 ex hoc] in hoc
Ba 8 in anno communi] om AUBC 9 354] ccc C Patet
etiam] patet autem B; quod patet U 10-11 spacio xi
dierum] xi diebus BC 11 duo] om C incipiant] incipiunt BC

terminabitur annus communis quam annus solaris, sicut
 C37ra patet quando sumus in tercio / anno cicli. Quare si
 luna fuerit prima in kalendis ianuarii eodem die anno
 revoluto erit duodecima propter illud excrementum
 Ba22rb 5 / xi dierum. Consimilis erit variatio in principio
 A113va cuiuslibet mensis / et etiam in quolibet die anni.
 Et propter hoc rectificandum invenerunt compotiste duos
 numeros, scilicet epactas et regulares lunares. Ad
 sciendum etiam cuius etatis sit luna in kalendis mensium
 U64r 10 ex / isto excessu xi dierum dantur quedam regule de
 etate lune respectu preteriti temporis et futuri. Si luna
 igitur supponatur hodie alicuius certe etatis, et velis
 cc330vb scire in anno futuro cuius etatis / erit hoc
 B71b eodem die, vel 3° vel 4° etc., etati lune quam modo /
 15 habet: adde xi, et tante etatis erit in anno
 futuro; illi iterum adde xi, et tante etatis erit anno
 tercio eodem die, et ita in infinitum, hoc tamen notato,
 quod si excrescat 30 maior numerus, 30 reiciantur et
 residuum ponatur pro etate lune. Si autem velis scire

20

1 terminabitur] terminatur A annus] om BC solaris]
 solaris xi diebus C sicut] quod A 2 anno cicli] cicli
 decennovenalis AccU quare] quia U 3 prima] om cc
 4 illud] illuc A 5 principio] kalendis A etiam] om C
 7 Et] Unde AccU hoc rectificandum] hanc variationem BC
 8 numeros] menses Ba lunares] om C 9 etiam] om ABC
 10 isto] isto autem C 10-11 regule de etate lune] om A;
 regule de etate lune respectu U regula] om U 12 igitur]
 enim BC hodie] om B 13-14 in anno futuro ... vel .4o.
 etc] cuius etatis erit hoc eodem die Acc 15 habet] habet
 luna C 16 Illi iterum] Illi iterum etati AU; Item illi
 etati C; Item illi etati id est illi toto numero B anno]
 in anno BC 17 eodem] in eodem BC ita] sic B in] om U
 18 excrescat] excrescant BC maior numerus] maior numerus
 quam BC reiciantur] reiciatur A 19 velis] vis BC

cuius etatis fuerit luna in eodem die anno preterito, vel
tercio, vel quarto, illi etati lune quam modo habet adde
U64v 19, et habebis etatem / lune in anno preterito,
etati iterum lune anni preteriti adde 19 et habebis
5 etatem lune tercii anni, et ita deinceps, hoc etiam
notato quod si maior numerus triginta excreverit,
reiciantur 30 et residuum indicabit tibi etatem lune.
Unde versus:

Ba22va Quinque dies et sex ponas pro luce futura, /
10 Et pro preterita quinque bis atque novem.

Sequitur de quarto anno lunari, scilicet de anno
embolismali, qui constat ex 13 lunationibus, ex diebus
autem 384. Unde excedit annum lunarem communem 30 diebus,
U65r / annum vero solarem / 19 diebus. Dicitur

A113bb 15 autem embolismalis annus ab embolismo, interceptio, sicut

1 fuerit] sit C in] hoc AccU eodem die] in h[oc] [d]ie
B; quod in hoc die C preterito] preterito proximo U
2 tercio] in tercio C quarto] in quarto et sic
ascendendo BC illi] om AccU 3 habebis] habes C in
anno] hoc die in anno B 4 etati iterum] vel etati B
5 lune tercii anni] eius in anno tercio AccU ita] sic
AUBC etiam] autem Acc 6 excreverit] excrescat Acc;
excreverit quam BC 7 indicabit] indicat BC tibi] om
AUBC Ba 9 ponas] pone A 10 preterita] preterito AccBC
quinque] B adds Item etas lune anni preteriti per
subtractionem .ix. sic haberi. Ab etate quammodo [l]une
subtrahe .xi. si potes et residuum fuit etas lune tali
die in anno pre[terit]o. Si vero lune etas quammodo habet
fuerit minor quam .xi. illi etati adde .xxx. et a toto
subtrahe .xi. et residuum fuit etas lune in anno
preterito. C adds a similar passage after novem; AccU add
Set istud per embolismum quandoque in uno die [ccU om in
uno die] fallitur sicut patet intuenti [incontinenti cc]
12 constat] contingit A ex] et B; et ex U 13 autem] om
B lunarem communem .30. diebus. Annum vero] om BC 14 19]
in 19 AccU 15 annus] annus iste A

bisextilis a bisexto. Quare videndum est quid sit
 C37rb embolismus, et unde oriatur, et ubi interponatur./
 Est igitur embolismus lunatio 30 dierum nulli mensi
 attributa, et dicitur ab embolismos quod est idem quod
 5 excrementum. Provenit autem ista lunatio ex xi dierum
 quibus annus solaris excedit annum lunarem communem. Ut
 igitur melius pateat ortus embolismorum, notandum quod
 ciclus decennovenalis dividitur in ogdecaden et
 endecaden. Ocdecas est spacium 8 annorum, endecas xi
 U65v 10 annorum. / In ogdecade 3 proveniunt embolismi, in
 endecade 4; unde totali ciclo erunt 7 embolismi, quod
 sic patet: in primo anno, secundo et tercio excrescunt 33
 dies, ex quibus in tertio anno est lunatio quedam 30
 dierum; et supersunt tres dies. Unde tertius annus cicli
 15 dicitur embolismalis a lunatione ita excrescente. In
 quarto anno, quinto et sexto excrescunt 33 dies. Ex 30
 diebus fit embolismus, sive lunatio excrescens. Unde
 Ba22vb sextus annus est embolismalis; / et supersunt 3

2 et] om C et unde oriatur] om U interponatur]
 interponitur A; intercipitur U 4 dicitur] dicitur
 embolismus AUBC idem quod] om AccU 5 excrementum]
 incrementum C autem] enim AccU ex xi diebus] ex
 cremento xi dierum AccU 7 notandum] nota C 8 ogdecaden]
 ogdeaden AccU; ogdoaden B; ocdecaden C 9 endecaden] in
 endecaden U Ocdecas est] ocdeas est A; ocdeade cc; et
 dicitur ogdoas B; et dicitur ocdecados C endecas]
 endecas est spacium AUBC 9-11 Ocdecas est ... In
 endecade .4.] U reverses order of sentences 10-11 In
 endecade ... 7 embolismi] om C 11 totali] in toto AccU;
 in totali B erunt] sunt AccU 12 secundo] et secundo B;
 et in secundo C tercio] in tercio C 13-15 lunatio ...
 embolismalis] embolismus Ba 14 annus] om A 16 quinto]
 et quinto BU 17 fit] om A lunatio] lunatio xxx dierum B
 18 et] et etiam C

dies, qui coniuncti cum tribus precedentibus sunt vi. In
 U66r septimo vero et octavo anno / excrescunt /
 cc331ra viginti et duo dies, quibus si addantur 6 supradicti
 erunt 28. Set ad completionem huius embolismi qui debet
 5 esse in octavo anno mutuatur duo dies a tempore
 A114ra sequenti. Unde octavus annus erit embolismalis. /
 Et ita habemus in ogdeade 3 embolismos. In nono autem et
 decimo et xi^o anno excrescunt 33 dies. Ex 30 diebus fit
 embolismus. Unde xi^{us} annus est embolismalis. Resignatis
 10 duobus diebus superius mutuatis restat unus dies. In
 duodecimo et xiii^o et xiiii^o excrescunt 33 dies. Ex 30 fit
 embolismus. Unde xiiii^{us} est annus embolismalis; et
 U66v supersunt 3 dies / qui coniuncti cum uno superius
 relicto iiii^{or} erunt. Quintodecimo et xvi^o et xvii^o
 15 excrescunt 33 dies. Set ex 30 diebus fit embolismus. Unde
 xvii^{us} annus est embolismalis; et supersunt 3 dies, qui
 coniuncti cum 4 precedentibus fiunt 7. In xviii^o et xix^o
 excrescunt xxii dies, quibus si iungantur 7 dies superius

1 dies] om C qui coniuncti] quibus coniunctis Acc; qui
 iuncti C 2 anno] om AUBC 3] quibus] qui cc 6] om Ba
 supradicti] supradictis cc; supra collecti C 4 28]
 xxviii dies BC completionem] completitudinem C 6
 sequenti] subsequenti Acc erit] est AccU 7 ogdeade]
 egdeate cc In nono autem] item in nono BC 8 Ex] et ex
 BC; set ex U 9 est] erit BC resignatis] resignatis
 autem AUBC; vel resignatis cc 10 In] Item in BC
 11 duodecimo] Xiio vero A xiiii] xiiii anno C ex] set
 ex BC 12 est] om A; sit cc 13 coniuncti] iuncti ccBC
 cum uno] uni Acc; uno C 14 erunt] fuerunt BC
 Quintodecimo] In 15 anno Acc; In 15 U; Item in xvo BC
 15 33] 30 A set] om AccU diebus] om BCU 16 et] om U
 17 coniuncti] iuncti BC cum] om U precedentibus]
 precedentibus diebus BC fiunt] sunt Acc In] Item in BC
 XIXo] XIX an[no] cc 18 iungantur] coniungantur Acc
 dies] om AccU

relicti fiunt 29. Set quia quilibet embolismus constat ex
30 diebus, mutuetur unus dies a lunatione Iulii in ultimo
anno cicli ad completionem ultimi embolismi. Unde

Ba23ra / cum in omnibus aliis annis cicli lunatio Iulii

U67r 5 sit 30 dierum, in ultimo anno cicli / erit 29 dierum. /

C37va Et iste dies ita subtractus dicitur saltus lune,

A114rb de quo patebit inferius. / Ad sciendum autem quoto
mense et quoto die mense interponitur embolismus in
kalendario sciatur iste versus:

10 Mobilis ibo ciphos ace liber habeto coevum.

U67v In hoc versu sunt 7 dictiones / servientes 7

1 fiunt] erunt AccU set] om C 2-3 in ultimo anno cicli]
om A completionem ultimi embolismi] complendum ultimum
embolismum BC ultimi] 7 AU 4 cum] om Acc 5 in] om Ba
29] tantum xxix BC 6 subtractus] subtractus a lunatione
iulii BC 7-9 Ad sciendum ... iste versus] AccU
substitute Quotus autem annus cicli decennovenalis sit
embolismus patet [scitur U] per hunc versum. Christe
factus homo levat omnia reddita trono. Unde [vide U]
quota sit litera prima [A om prima] alicuius dictionis in
alphabeto est tantus annus embolismalis. Idem etiam [cc
om etiam] sine labore tenetur [habetur cc; retinetur U]
per hos versus. Tertius et sextus octavus et undecimalis.
Et quartus decimus decaseptimus et decanonus. ad sciendum
autem quoto mense et quoto die mensis interponatur
embolismus sciatur iste versus. 7 quoto] quo B 8
interponitur] interponatur BC 8-9 in kalendario]
kalendariis BC

B72r

em/bolismis, prima primo et ita deinceps. Vide
igitur quota sit littera prima alicuius dictionis in
abecedario: a tanto mense est embolismus cuius dictionem
sumpsisti. Vide etiam quota sit prima littera secunde
5 sillabe eiusdem dictionis, et tanto die eiusdem mensis
erit sedes embolismi. Quotus autem annus cicli
decennovenalis embolismus patet per hunc versum:

Christe factus homo levat omnia reddita trono.

Vide quota sit litera prima alicuius dictionis in
10 abecedario, et tantus annus est embolismalis. Notandum
autem quod multiplex error contingit in kalendario per
embolismum, scilicet error vicissitudinis, /

CC331rb

1-10 Vide ... est embolismalis] AU substitute Vide
igitur quota [A om quota] sit prima litera alicuius
dictionis [A om prima alicuius dictionis] in alphabeto. a
[in U] tanto mense interponatur [ponatur cc; interponitur
U] embolismus cuius dictionem sumpsisti. Vide etiam quota
sit litera prima [A add alicuius dictionis] secunde
sillabe eiusdem dictionis et tanto die eiusdem mensis
erit sedes [dies U] embolismi. 1 igitur] ergo BC
2 alicuius] om B 3 abecedario] alfabeto C tanto] toto
BC 7 embolismus] embolismus ille BC Vide etiam] Item
vide BC 9 prima] prime dictionis BC; om C 10
abecedario] alfabeto C tantus] totus BC est] erit BC
Notandum] Nota BC 11 autem] igitur A; etiam U; om BC
kalendario] kalendariis B 12 scilicet] quandoque AU;
quoniam cc vicissitudinis] BC add quando lunationes
simul sunt.xxx. dierum. error] om A terminationis] BC
add quando lunationes terminantur extra suos menses
error] et error Acc; Item error B

error terminationis et error variationis. Error
 vicissitudinis est quando simul sunt plures lunationes 30
 dierum; error terminationis quando lunationes terminantur
 U68r extra suos menses; error variationis quando mensis /
 C372D 5 positus in impari loco imparem habet lunationem, positus
 Ba23rb in numero pari / habet parem. Preterea error
 contingit ex eo quod menciuntur epacte. Primus igitur
 embolismus incipit secundo die Decembris et terminatur
 ultimo die eiusdem; et contingit error vicissitudinis,
 10 quia lunatio embolismalis et lunatio Ianuarii simul sunt
 30 dierum, et si sit bisextus, 4 erunt lunationes 30
 dierum, scilicet lunatio embolismalis, Ianuarii,
 Februarii et Marcii. Preterea embolismus iste
 intercipitur secundo anno cicli nostri cum tamen
 A114va 15 secundum eius originem / deberet intercipi in
 tercio. Et ratio huius est quia cum ciclus illorum qui
 embolismos invenerunt incipiat a Septembri et 4 mensibus

1 variationis] BC add scilicet quando mensis positus in
 numero pari habet parem lunationem [C add positus in
 pari imparem]; Acc add et error absolute 1-6 Error
 vicissitudinis ... habet imparem] om C 3 terminationis]
 terminationis est U 4 Error] et error AU quando] est
 quando AU 5 positus] qui ponitur U in impari loco
 imparem] in numero impari parem Ba; pari termino parem
 cc; pari numero parem U 5-6 positus in numero pari habet
 parem] positus in numero pari habet imparem Ba; positus
 in pari habet parem A; positus in impari imparem ccU 6-7
 Preterea error contingit] Error simpliciter A; Error est
 U; Item contingit error B; Error Ba 7 igitur] ergo BC 8
 secundo] secunda BC 10 simul] similiter C 11 sit] fuerit
 U bisextus] annus bisextilis B; bisextilis C 11-12
 lunationes erunt 30 dierum] om Ba ianuarii] et ianuarii
 AccBC 13 februarii] et februarii BC iste] om A; ille cc
 14 secundo] in secundo B tamen] om AU 16 tercio] tercio
 anno BC et] set AccU est] est hoc U quia] quod Acc; om
 BC cum] om U 16 illorum] eorum U 17 incipiat] incipit U

U68v precedat / ciclum nostrum qui incipit a Ianuario,
cum simus in fine secundi anni cicli nostri ipsi iam de
tercio anno cicli sui peregerunt 4 menses. Secundum hoc
embolismus iste intercipitur tercio anno cicli illorum et
C37vb 5 in secundo cicli nostri. / Secundus embolismus
incipit secundo die Septembris, et terminatur prima die
Octobris. Et contingit error vicissitudinis, quia lunatio
Septembris et embolismus simul sunt 30 dierum. Preterea
iste embolismus assignatur in 5° anno cicli nostri, cum
10 deberet assignari in 6^{to}. Ratio huius est quia cum adhuc
duret quintus annus cicli nostri iam incipit sextus annus
cicli illorum. Tercius embolismus incipit 6 die Martis et
U69r terminatur quarto die A/prilis. Et contingit error
Ba23va vicissitudinis, / quia lunatio Martis et
15 embolismus simul sunt 30 dierum, et si sit bisextus 4
lunationes, Februarii, Ianuarii, Martis et embolismi. Et
contingit etiam error terminationis, quia lunatio Aprilis
terminatur tertia die Maii, et lunatio Maii secundo die

1 incipit] incipiat C 2 cicli nostri] om A iam] namque
U 3 secundum] et secundum AccU; om C 3-4 hoc embolismus
... tercio anno] hoc iste embolismus bisexto [text
corrupt] C 4 illorum] eorum A 4-5 et in] a A; et cc;
etiam C 5 secundo] secundo anno Acc secunda BC 6 prima]
primo AccU 9 iste] ille C 10 deberet] deberes C huius]
huius autem est C quia] quod Acc 11 duret] durat AC;
duraret B iam] om Acc incipit] incepit Ba 12 illorum]
eorum A 14 quarto] quarta C 15 4] erunt 4 U 16
lunationes] sunt simul scilicet A; 4 lunationes erunt
simul cc; scilicet U martis] et martis cc embolismi]
embolismus B et] om cc; item BC 17 etiam] om BCU
18 tertia] tercio U secundo] secunda Ba

Iunii, lunatio Iunii primo die Iulii. Eo etiam anno
menciuntur epacte in principio Maii et Iulii, ut patebit
infra. Notandum etiam quod in anno quarto cum lunatio
Martis incipiat ante locum bisexti si sit annus
5 bisextilis, videbitur lunatio Martis esse 31 dierum et
cc331va lunatio Februarii tantum / 29 dierum. Ad istos
U69v errores vitandos / ut supratactum est, lunatio
A114vb Martis / deberet postponi per unum die, ita quod
ubi lunatio Martis deberet dici prima lunatio Februarii
10 pronuncietur 30, et ita in crastino lunatio Martis prima.
Quartus embolismus incipit tertia die Ianuarii et
terminatur prima die Februarii. Et contingit error
vicissitudinis, quia lunatio Ianuarii et embolismus simul
sunt 30 dierum, et si sit bisextus 4 lunationes erunt
15 simul 30 dierum, scilicet Ianuarii, embolismi, Februarii
et Martis. Contingit etiam error terminationis, quia

1 primo] prima Acc; etiam prima U; terminatur prima B
iulii] C add ipsi autem de tercio anno cicli sui
peregerunt .iiii. menses. secundum hoc iste embolismus
intercipitur in tercio anno cicli illorum et in secundo
anno cicli nostri eo etiam] Item eodem BC 2 menciuntur]
tunc menciuntur A 3 infra] inferius BC Notandum] Nota
BC etiam] om A 4 incipiat] incipit Acc 5 videbitur]
videbitur duplex inconueniens contingere scilicet quod U
lunatio martis] om Acc dierum] diei ABU 6 tantum] om A
Ad] Set ad ccU 7 vitandos] evitandos C ut supratactum
est] ut dictum est A; ut supra dictum ccB; sicut supra
tetigi C 8 deberet] debet BC 8-9 postponi ... martis
deberet] om Ba 8 ita quod] sicut B et] om C; ita om
AUBC 10 prima] secundo BC 11 ianuarii] february A
14 sit] fuerit U 14-15 lunationes ... dierum] om AU; 4
erunt lunationes cc 15 embolismi] embolismalis cc 16 et]
om BC contingit etiam] et contingit B; contingit C

lunatio Februarii terminatur in Martio, lunatio Martis in
 Aprili. Embolismus iste intercipitur in undecimo anno quo
 U70r ad nos et quo ad / illos, et ita bene.
 Ba23vb Preterea/ tunc menciuntur epacte in principio Martis nisi
 C38ra 5 sit bisextus. / Quintus embolismus incipit secundo /
 B72v die novembris et terminatur primo die Decembris.
 Et contingit error vicissitudinis, quia lunatio Novembris
 et embolismus simul sunt 30 dierum. Et notandum quod iste
 embolismus est causa quare in secundo die Decembris in
 10 una linea ponantur duo numeri, scilicet 13 et 2: si enim
 13 ponerentur in primo die Decembri duplex error
 contingeret, scilicet quod embolismus precedens esset 29
 dierum tantum et lunatio Decembris 30 dierum, cuius
 contrarium semper continget. Preterea iste embolismus
 U70v 15 intercipitur xiii° anno cicli nostri et / xiiii°

1 in martio] secundo die martis AccU 1-2 in aprili]
 prima die aprilis AccU 2 embolismus] Item embolismus B
 intercipitur] interponitur C In] om AccU anno] anno
 cicli BC 3 et] om U et ita bene] et ita [lacuna] Ba; om
 BC 4 Preterea] prima et Ba 5 bisextus] BC add Notandum
 quod multi hunc embolismum quartum incipiunt quarta die
 decembris in xo anno secundum quod ponunt [ponit C] in
 versu hanc dictionem modo et non hanc dictionem ace. et
 terminatur eundem embolismum secundo die ianuarii et
 secundum hoc lunacio illa que incipit .iii. die ianuarii
 erit lunacio ianuarii licet terminatur [terminetur B] in
 februario [se B]. set competentius fieri potest priori
 modo quia tunc pauciores [om pauciores C] lunationes
 scilicet tantum due terminabuntur [significantur C] extra
 suos menses. et ita intercipientur [intercipientus est C]
 ille embolismus in xio et non in xo anno 6 primo] prima
 AccU 7 contingit] est BC 8 notandum] nota BC
 10 ponantur] ponuntur BCU 11 ponerentur] ponentur C
 duplex] multiplex U 12 embolismus] embolismus contingens
 C 13 tantum] om AccU dierum] om BC 14 contrarium]
 conversum BC semper continget] videtur semper contingere
 B iste] ille U 15 xiii] in 13 A

cicli eorum. Sextus embolismus incipit secundo die Augusti et terminatur ultima die eiusdem. Et contingit error vicissitudinis, quia embolismus et lunatio septembris simul sunt 30 dierum. Preterea videtur quod

All5ra 5 male assignetur / iste embolismus, quia iste annus xvi^{us} est tam cicli eorum quam cicli nostri. Iste autem embolismus debet intercipi in xvii^o anno quo ad nos et quo ad illos. Ratio huius est hec: xvi^{us} annus existens communis suas xii lunationes terminat in prima die

10 augusti. Unde iste embolismus statim subsequens attribuitur anno 17 sequenti, et est tanquam eius

U71r initium. Unde / potest sic assignari in 17^o anno quo

Ba24ra ad nos et quo ad illos. Septimus / embolismus

cc331vb incipit v^o / die Martis et terminatur tertia die

15 Aprilis. Et contingit error vicissitudinis, scilicet quod lunatio Martis et embolismus simul sunt 30 dierum, et si sit bisextus 4 lunationes contingunt simul, scilicet Ianuarii, Februarii, Martii et embolismi. Contingit etiam

1 eorum] eorum ratione superius dicta A; ciclorum ratione superius supradicta cc; illorum ratione predicta U; illorum B 2 ultimo] ultima AB; in ultimo U die] om C 4 septembris] augusti C 5 assignetur] assignatur B quia] quoniam A 6 eorum ... nostri] nostri ... illorum BCU 6-7 Iste autem embolismus debet] deberet autem AccU quo] vel quo BC et] vel AUBC 8 Ratio] Ratio autem A huius] om BC 9 communis] om Ba terminat] terminatur C in] om U prima] primo BC 10 statim] om U subsequens] sequens A 11 17] om U 12 potest] posset U 17] iio Ba anno] om U quo] non quo AccU; vel quo BC 13 et] set AU; vel BC 14 tertia] tercio AUBC 15 scilicet quod] quia AUBC 17 bisextus] bisextilis C contingunt simul scilicet] om Ba; simul sunt cc; contingunt simul] om BC 18 embolismi] embolismus C 15 Contingit etiam] contingit B; om C

error terminationis, quia lunatio Aprilis terminatur
secunda die Maii et lunatio Maii prima die Iunii.

Menciuntur etiam epacte ad ostendendum etatem lune in
principio Maii et Augusti. / Preterea in hoc anno

5 cum lu/natio Martis incipiat ante locum bisexti si
sit bisextus, videbitur 31 dierum esse. Set ita faciendum
est sicut fecimus in tercio embolismo. Quare autem isti
vii embolismi in predictis mensibus et predictis locis
intersecantur ratio est quia si alibi ponerentur plures
10 contingerent errores et plures mencierentur epacte.

Sequitur de epactis et regularibus lunaribus. Epacta
est numerus 30 non excedens, proveniens ex
superhabundancia anni solaris ad annum lunarem communem.

Non excedens xxxa dico, quia cum offi/cium epacte
15 sit ostendere etatem lune, nulla autem etas lune est
maior quam 30 dierum, nec epacta debet esse maior.

Proveniens ex superhabundancia etc. dico, quia epacta

provenit ex cremento xi dierum ex quo / et embolismus.

Primus igitur annus cicli decennovenalis non habuit
20 epactam, quia non precessit annus ex cuius

2 secunda] secundo AUBC et] om ABC maii] maii
terminatur C prima] primo ACU 3 Menciuntur etiam] Item
menciuntur BC 5 incipiat] incipit BC 6 set] om U ita]
om AccU 9 intersecantur] intersecuntur B; interserantur
C; intersecalentur U est] est commoditas AccU alibi]
alii C plures] pluries B 10 epacte] epacte Capitulum 11
de epactis et R B 11 Sequitur] 14 Sequitur U et] et de
C et regularibus lunaribus] [...]rentur epacte U 11-12
Epacta est numerus] Est autem epacta U 14 xxxa dico]
dico AccU; xxx dies C 15 est] sit BC 16 quam] om U
dierum] diebus U 17 etc] anno B dico] dicitur U quia]
quod cc 18 ex] de BC 19 Primus] Unde primus C cicli] om U

inequalitate potuerit habere epactam; vel hac ratione non
A115rb habuit / epactam, cum ultimus annus decennovenalis
sit quasi proximus ante primum annum cicli, et ille
habuit 18 pro epacta, et in eodem anno excrescunt xi dies
5 et unus de saltu lune, erunt in universo 30. 30 autem est
U72v / quasi nulla epacta, quia 30 iuncta cum regulari
aliquo debent deleri; et secundum hoc primus annus
epactam non habuit. Secundus habuit xi pro epacta,
tercius 22, quartus 3, quia reiciuntur 30, et ita
10 formetur deinceps per additionem xi. Idem autem scitur
hiis versibus:

cc332ra Que tenet undenas Aprilis luna kalendas. /
Epacte numerum monstrat per quemlibet annum.
Vide cuius etatis sit luna xi kalendas Aprilis et tantus

15

1 potuerit habere] haberet AU; oriretur BC epactam] om
BC 2 cum] cum enim Acc; quia C ultimus] om BC annus]
annus cicli AU 3 primum] ultimum A 4 habuit] habet BC;
habeat quasi A; habeat ccU 5 unus] unus BC de] ex AccU
erunt] erit A; et erunt C 30] xxx dies BC 30 autem est]
triginta sunt Acc; set 30 sunt U 6 quia .30. iuncta] quo
adiuncte A; quia triginta adiuncta ccU 7 aliquo] om B;
aliquando C deleri] deleri ad ostendendum etatem lune
AccU 8 Secundus] Secundus annus BC; Set secundus U 9
22] etiam xii C 3] 30 A reiciuntur] reiciantur B
ita] sic BC 10 formetur] formatur epacta Acc; formetur
epacta U Idem autem] Item A; Idem cc 11 hiis versibus]
per hos versus AUBC 12 Que] Quem Ba 14 Vide] Vide ergo
BC cuius etatis sit luna] quota sit litera A; quota luna
sit ccU tantus] totus B

numerus erit epacta illius anni. Vel sic docetur per
additionem illorum xi ad epactam anni precedentis:

U73r Predocet epactam / Maii lux prima futuram.

Ad sciendum autem epactam sine kalendario sciatur iste
5 versus:

Deme unum, post adde novem post undevicenos.

C38va Ponatur primus annus cicli in radice / pollicis,
secundus in media iunctura, tercius in summitate, quartus
iterum in radice pollicis, et ita circulariter computes

Ba24va 10 annos cicli donec occurrat annus cuius epactam /
queris. Ille igitur vel est in radice pollicis vel in

U73v media iunctura vel / in summitate. Si in radice
subtrahatur unitas, si in media iunctura adde ix, si in

B73r summitate adde 19 et habebis epactam anni quesiti. / Dicitur

15 autem epacta quasi epiaucta, quod est supra aucta,
propter illud crementum superius dictum; vel epacta quasi
epi adiecta, quia ipsa superadiecta regulari

1-2 docetur ... anno precedentis] om AUBC predocet ...
figuram] Ba places after Ad sciendum hii versus
kalendario] cc 3-4 sciatur iste versus] sciantur hii
versus Ba 3 futuram] figuram Ba; AU add Per additionem
enim illorum .XI. que ponuntur pro [in U] aureo numero [U
adds scilicet] in prima die maii ad epactam anni
precedentis haberetur epacta anni subsequens [sequentis
U]; futuram. que quanta est distancia a prima luna usque
ad kalendas C 6 undevicenos] undevicenos. id est. xix B
cicli] cicli decennovenalis A 8 summitate] summitate
pollicis C 8-9 quartus iterum in radice] om C 9
pollicis] om AUC 11 igitur] ergo BC vel est] vel erit
BC; om U vel] om Acc 12 summitate] summitate est U Si]
Si sit B 13 iunctura] om A adde] addatur U adde] om C
14 et] et ita AccU habebis] habes C quesiti] quesitam C
15 quod] id BC 16 aucta] acta C illud] illuc A; istud U
crementum] excrementum AB; incrementum U vel] vel
dicitur AUBC 17 epi adiecta] equi adiecta A; superacta BC
quia] quia quando C superadiecta] superaddita Ba

ostendit etatem lune. Regularis lunaris est numerus 30
 non excedens qui iunctus cum epacta manifestat etatem
 U74r lune in kalendis mensium. 30 non ex/cedens expone ut
 A115va prius. / Set illud membrum coniunctum cum epacta
 5 ostendit tam officium epacte quam regularis. Origo autem
 regularium lunarium talis est, quod quilibet mensis habet
 adhuc tot pro regulari quota fuit luna in kalendis
 mensium in principio compositionis kalendarii et semper
 habebit. Ad hoc sciendum supponamus quod simus in primo
 10 anno cicli, et patet propositum in Februario et sex
 U74v mensibus sequentibus; / set de Septembri et 4^{or}
 mensibus sequentibus illum supponatur 19^{us} annus cicli,
 quia ille fuit quasi proximus ante primum, et secundum

1 ostendit] ostendi A lune] lune in kalendis mensium]
 AU; lune. Capitulum 12 de regulari lunari B 2 iunctus]
 adiunctus AU 3 excedens] excedens etc B expone ut]
 exponent Ba; dico ut B 4 prius] supra B set] om BC
 illud] illuc A coniunctum cum epacta] qui adiunctus etc.
 Acc; qui adiunctus cum epacta U; qui iunctus etc B; qui
 iunctus cum epacta C 5 ostendit] manifestat B; et cum
 manifestat C quam] om B 6 quod] quod quoniam A 7 adhuc]
om ccBC fuit] fuerit AccU 8 mensium] mensium eius A;
 eius U compositionis kalendarii] mundi BC 9 habebit]
 habebis A supponamus] supponatur AU simus] sumitur Ba;
 sumus C 10 cicli] cicli decennovenalis AU patet]
 patebit C sex] in vi AU 11 sequentibus] sequentibus,
 quoniam in primo anno ciclo [decennovenalis C] aureus
 numerus est unitas x die ante kalendas februarii et sic
 luna est decima in kalendis eius; unde x habet pro
 regulari. Similiter considera aureum numerum scilicet
 unitatem ante [kalendas U] aliorum vi mensium sequentium
 et in antecedente [om U] [manifeste U] patebit regularis
 4^{or}] de 4 BCU 12 illum] illum dubium est quia incipiunt
 [B adds autem] epacte et regulares lunares a septembri et
 non precessit BC; illis U cicli] cicli viii AccU
 13 et] unde C

hoc habet September 5 pro regulari. Et si velis omnes
U75r alios formare uno supposito, sume / dies
Ba24vb Septem/bris et adde suum regularem, et a totali
cc332rb subtrahatur lunatio eiusdem mensis, et / residuum

5 est regularis lunaris sequentis mensis. Similiter de
aliis. Unde versus:

Quinque Sep, oc dantur No De, 7 ter tria Ia Mar,
Feb a decem sumant post unum cuilibet addas.

vel sic:

10 Post E bis, G bis, post I K bis manet ordo.

Vel sic:

Estuat esurit gramen gravat igne kalendas,

U75b Igne kalendarum licet mihi nominis ordo. /

1 regulari] regulari. quia .v. die ante kalendas eius est
aureus numerus .19. et similiter considerandum est de
hiis [aliis U] quatuor mensibus [om mensibus A]
sequentibus AU; regulari. et in illo xix ano prima
currit per xix B velis] ciclis cc 2 alios] alios
sequentibus regulares A; alias regulares U; alias BC uno
supposito] illo regulari supposito B; ab illo regulari
supponitur C dies] omnes dies U 3 totali] totali numero
AccU 4 lunatio] luna A mensis] mensis sequentis A;
lunaris mensis sequentis U 5 est] erit BC lunaris
sequentis] om A; lunaris B mensis] om C 5-6 Similiter
de aliis] Similiter de omnibus aliis AU; et sic de
singulis BC 7 dantur] detur C no] ne Ba 9 vel sic] om
Bacc 10 k bis manet ordo] liber manet ordo Ba 11 vel
sic] om Bacc 12 estuat esurit] extuat exurit C igne]
iungere C 12 kalendarum] kalendarum C licet mihi] lucet
quia Ba; lucet michi cc; lucet mihi UB in nominis]
nominis AUBC

Vide quota sit prima litera alicuius dictionis ultimorum
 C38vb versuum etc. Habito quidem quid / sit epacta et
 quid regularis lunaris, si vis scire etatem lune in
 A115vb kalendis alicuius mensis, sumatur epacta / anni et
 5 regularis illius mensis, et ex illis coniunctis vel
 proveniet 30 vel maior numerus vel minor. Si 30 vel minor
 numerus, tante etatis fuit luna in kalendis illius mensis
 cuius regularem sumpsisti; si maior, reice 30, et
 U76r residuum manifestabit etatem lune. / Notandum etiam
 10 quod epacte et regulares lunares sicut embolismi
 incipiunt a Septembri. Et est epacta numerus variabilis,
 regularis numerus invariabilis. Menciuntur autem epacte
 et regulares lunares in toto ciclo decennovenali
 quinquies quoniam bis in octavo et simul in xi et bis in
 15 ultimo anno; unde versus:

Fallitur octavo cum Maio Iulius anno.

1 prima] om Ba alicuius] om BC dictionis] dictionis in
 alphabeto. et tot habet pro regulari [U add lunaris]
 mensi cui servit illa diction AU 1-2 ultimorum versuum
 etc] om AU; sumpto principio a septembri B; sumpto primo
 a septembri C 2 quidem] iam A; autem U; om BC 2-3 et
 quid] quid AccU; sive Ba vis] velis AU etatem lune]
 cuius etatis sit luna BC 3-4 in kalendis alicuius
 mensis] om A 4 alicuius] mensis cuiuslibet B; mensis C
 et] cum A 5 regularis] regulari AU illius] ipsius AU
 et] om AccBC coniunctis] iunctis BC 6 proveniet]
 provenient BC; eveniet A; emerget [?] U maior numerus]
 minor numerus B; minor C minor] maior BC 7 fuit] sit A
 erit luna] om BC 8 maior] maior numerus BC 9 Notandum]
 Nota C etiam] om A; item U 10 lunares] lunationes Ba
 sicut] sicut et U 12 regularis] regularis vero AU
 numerus] om U Menciuntur autem] Item menciuntur BC
 13 lunares] lunationes Ba 14 simul in xi et bis in
 ultimo anno] in octavo et xi et ultimus annus Ba; quoniam
 bis in 8vo in ... in ... in] om BC AU octavo] lacuna cc

Ba25ra Dicunt regulares et epacte quod in octavo / anno
in kalendis Maii luna sit 28 dierum, cum tamen sit revera
27 dierum. Dicunt etiam in eodem anno quod in kalendis
Iulii luna sit 30 dierum, cum tamen revera sit 29 dierum.

U76v 5 / Item versus:

Ni sit bisextus fallit Martem a deca primus.

Dicunt enim epacte et regulares quod xi° anno in kalendis
Martis luna sit 29 dierum, cum tamen sit 28, set si sit
bisextus tunc duo dies computantur super 6 kalendas
10 Martis. Unde non tunc fallunt epacte.

Ultimus Augustum cum fallit fallit quoque Maium.

cc332va Item dicunt epacte et regulares quod in ul/timo anno
cicli in kalendis Maii luna sit 29 dierum, cum tamen sit
28. Dicunt etiam in kalendis Augusti lunam esse duorum
15 dierum, cum tamen sit trium dierum, quod contingit
propter saltum lune, quia lunatio Augusti prius incipit
uno die quam deberet si non esset saltus lune. Si autem

1 dicunt] dicunt enim AUBC regulares] regulares lunares
B quod] om U 2 in] quod in U 3 etiam] Item BC 29]
20 xxviii A dierum] om C 5 versus] dicunt epacte et
regulares Ba 6 Ni] Si Ba; nisi C martem] lacuna cc a]
om AU a deca primus] Unde versus ni sit bisextus fallat
mars a deca primus a deca id est C 7 Dicunt enim epacte
et regulares] om Ba Dicunt enim] Dicunt quidem AU; Item
dicunt quidem cc xio anno] in ultimo anno cicli A 8 29
dierum] xxx dierum B; om dierum U sit] om cc; revera sit
ABC sit 28] 28 dierum AU 8-13 Set si ... sit 28] om U
9 bisextus] bisextilis C computantur] computentur A
10 non] om Acc tunc] om Ba 11 augustum] augustus Acc
12 Item dicunt] dicunt A; dicunt enim ccC regulares]
regulares lunares B quod] om A cicli] cicli quod A
13 maii] maii quod A sit] esse C sit] revera sit B 14
Dicunt etiam] Item dicunt BC; etiam] etiam in eodem anno
AU 15 sit] revera sit BC dierum] om BC si non] nisi
BC 17 saltus] scilicet saltus C Si autem] Item si BC

vis scire in quoto anno cicli epactarum simus, utendum
A115+ra est eodem artificio quo utebatur / ad sciendum in
quoto anno cicli decennovenalis essemus, addendo unitatem
U77r annis Domini etc. Et notandum quod iste / ciclus non
5 differt ab illo nisi quod prius incipit spatio 4 mensium,
scilicet a Septembri, ille vero a Ianuario.

Sequitur de saltu lune. Est autem saltus lune
C39ra sub/tractio unius diei a lunatione iulii in ultimo
Ba25rb anno cicli decennovenalis. Et nisi fieret talis /
10 subtractio dicunt quod post unum ciclum luna diceretur
prima ubi esset secunda. Similiter post 15 ciclos
peractos diceretur prima ubi esset quintadecima.
Perceperunt enim compotiste quod magis temporis
B73v attribuitur / cuilibet lunationi quam deberet
U77v 15 attribui, 4 momenta, scilicet, et una uncia, et unus
atomus. Qualiter ex hiis ^{or}iiii minutiis colligatur unus
dies videamus in toto ciclo decennovenali, prius
numerantes summam lunationum tocius cicli. In ciclo
igitur decennovenali sunt 12 anni communes et vii

20

1 vis] velis AU cicli] om A simus] sumus C 2 eodem] eo
C utebatur] utebatur prius BC in] om U 4 Notandum]
nota BC 5 prius] iste Ba spatio] per spatium B
6 scilicet] scilicet iste BC ianuario] ianuario. 7
Capitulum 13 de saltu lune B Sequitur] [cap] 17 Sequitur
U 8 in] om B 9 fieret] fuerit Ba 10 dicunt] dicunt
compotista AUBC ciclum] ciclum peractum AU luna] om Ba
11 esset] deberet dici BC Similiter] Patet B 15] vi Ba
luna] om BaAU 12 esset] deberet dici BC enim] ergo U
magis] plus ABC; maius U 16 unus] una B; om C minutiis]
om Ba [lacuna] 17 dies] dies naturalis B 17-18 prius
numerantes] primo annumerantes ABC; prius annumerantes U
19 igitur] autem BC 12 anni communes] 22 A

embolismales. In 12 annis communibus 144 sunt lunationes.
 In vii embolismalibus sunt 91 lunationes, que lunationes
 iuncte cum superioribus faciunt 235 lunationes. Si igitur
 a qualibet istarum lunationum subtrahantur 4 momenta,
 5 erunt in universo 940 momenta. Unde si ille numerus
 momen/torum dividatur per 40, erit numerus horarum 23; et
 sunt in residuo 20 momenta, una scilicet dimidia hora.
 Cum etiam in qualibet lunatione superflue sumatur una
 uncia, erunt tot uncie quot lunationes, qui numerus
 si dividatur / per 12, erunt 19 momenta; et sunt
 in residuo vii uncie. Cum iterum in qualibet lunatione
 superflue sumatur unus atomus, erunt tot atomi quot
 lunationes; qui numerus si dividatur per 47, erunt 5 /
 uncie, ita quod nichil est residuum; que
 15 coniuncte cum vii unciis faciunt unum momentum. /
 Illud etiam momentum sumptum / cum 19 momentis
 collectis ex unciis faciunt 20 momenta, id est dimidiam
 horam; que si addatur 23 et dimidie prius collectis,
 erunt in universo 24 hore, et ita unus dies naturalis.
 20 Iste igitur dies sic collectus artificialiter subtrahatur

1 12 In 12] et in 12 B 2 91] 19 A que] et iste] B; et C
 3 iuncte] simul iuncte BC 2-3 que lunationes ... 235
 lunationes] om Acc igitur] ergo BC 4 momenta] momenta.
 id est. si multiplicetur ille numerus [U add lunationum
 totalis] per 4 AU 5 940] [9]40 A [lacuna] Unde si] si
 ergo BC 6 erit] exhibit A; et exhibit U 7 una scilicet]
 id est BC 8 Cum etiam] Item cum BC 11 Cum iterum] Item
 cum BC; Cum igitur U 12 unus] una B 14-15 que
 coniuncte] que uncie iuncte BC 15vii unciis] 7 superius
 relictis AU; 7 unciis relicis C; vii unciis superius
 relictis B 16 illud etiam] item illud BC; illud etiam A
 17 dimidiam] unam dimidiam U 18 23] 23 horis AUBC prius
 collectis] om U 20 igitur] ergo BC

a lunatione Julii, sicut a lunatione 30 dierum ultima in
ultimo anno eorum qui annum suum incipiunt a Septembri;
et dicitur saltus lune, quia ultimo anno cicli cum
U79r deberet pronunciari lunatio Julii 30 pronun/ciatur
5 lunatio Augusti prima. Et remanet lunatio Julii 29
dierum. Unde ibi simul sunt 3 lunationes 29 dierum,
scilicet Junii, Julii et Augusti. Set notandum quod cum
hec subtractio ab autoribus sit autentica, tamen habet in
se multiplicem questionis scrupulum et falsitatis
10 admixtionem que alias pro loco et tempore verificatur.

C39rb Sequitur de festis mobilibus. / Sunt autem
quinque festa mobilia: Septuagesima, Quadragesima,
U79v Pa/scha, Rogationes et Pentecoste. Dicitur autem
Septuagesima a 70, quia illud tempus recolit Ecclesia ad
15 memoriam 70 annorum in quibus filii Israeli erant
Ba25vb / in servitute Babilonica. Quadragesima dicitur a

1 30] 3 U ultima] om U ultimo] om BaA 2 annum] ciclum
AU 3 ultimo] in ultimo BU cum] ubi BCU 4 pronunciatur]
pronunciabitur U 5 29] tantum xxix BC 6 simul] om U
7 augusti] AU add et sic ibi contingit error variationis
quia mensis positus in pari [impari U] loco parem
[imparem U] lunationem notandum] nota BC; notandum est U
quod] licet quod C cum] licet B 8 sit] om cc tamen]
cum Ba; om C in se] om C 9 questionis] om C 10 que
alias pro loco et tempore verificatur] om AU
verificatur] pacificabimus B; verificabimus C
11 Capitulum 14 de festis mobilibus B festis] quinque
festis Ba. mobilibus] mobilibus. [cap] 18 U autem]
igitur A; autem precipue C 12 mobilia] mobilia scilicet
AUB 13 et] om B 14 70] septem Acc a 70 quia illud
tempus recolit ecclesia] quia ieiunat ecclesia per lxx
dies BC 15 in] om AU 16 babilonica] babilonica C
Quadragesima] Quadragesima autem C

40, et illud tempus recolit Ecclesia quia Moyses tot diebus ieiunavit et legem recepit, Helyas tot diebus ieiunavit et raptus est in celum vel in locum dei secretum, Christus etiam tot diebus ieiunavit et diaboli

U80r 5 vincit temptationes. / Triginta autem sex dies et dimidius sunt anni xa pars, set quatuor dies cinerum

A115+va superadditi faciunt / 40. Set sicut res nostras

cc333ra decimamus, ita nostram vitam decimare debemus./ Pascha, phase, transitum idem sonant, et sic dicitur vel propter

10 transitum angeli exterminatoris in vetere lege in Egipto; vel quia Dominus transivit de morte ad vitam resurgendo. Dies dominicus precedens ieiunia Rogationum appellantur Rogationes in compoto propter Rogationes sequentes.

U80v Pentecoste dicitur a penta quod est quinque / et

15 coste quod est decem, quasi quinquies decem: sunt enim 50 dies inter Pascha et Pentecostem, utroque die incluso.

1 40] xl A 2 recepit] recepit a domino AccU; accepit BC helyas] Helyas autem AU 3 ieiunavit] om cc 4 etiam] om B; autem U ieiunavit] ieiunavit similiter Acc 3 temptationes] AU add et cum [om A] omnis christi actio nostra est instructio ergo et nos [igitur U] tot diebus ieiunare debemus. et hoc rationabiliter 5 autem] enim AU; Item B; om C 6 cinerum] om C 7 set] quia AUBC res nostras decimamus] decimamus nostra BC 8 ita] ita et AUcc; 9 transitum] transitus AU sonant] sonat ABC sic] om BaB vel] om CU 11 transivit] transiit C vitam] om C resurgendo] resurgendo eo die B 13 rogationes] om A sequentes] subsequentes BC 15-16 enim 50 dies] enim xl dies Acc; om BC

1-5 Cf. Exod. 24, 18; 4 Reg 2, 11; Marc. 1, 13. 9 Cf. Exod. 12, 11; 10 Exod. 12, 23.

Notandum igitur quod plura genera numerorum inveniuntur
 ad sciendum hec festa sicut inferius patebit. Et dies
 ante festum ubi terminantur huius numeri appellantur
 termini. Est autem regula in compoto quod terminus et
 5 festum nunquam simul sunt, et hoc ne videamus Iudeos
 imitare, qui simul ponunt terminum et festum; vel hac
 Ba26ra ratione, quia terminus Pasche semper est xiiii° /
 die lunationis Aprilis, set cum illa 14^a dies non semper
 U81r sit / prima feria, non potuerunt simul esse terminus
 10 et festum. Cum terminus iterum sit xiiii° die lunationis
 Aprilis, et Pascha magis accedens ad terminum sit 15 die,
 non potuerunt simul esse terminus et festum. Quare autem
 festa mobilia non habeant certa loca in kalendario hec
 est causa: Pascha sicut cetera festa mobilia semper habet
 B74r 15 celebrari die dominica. / Set cum unus et idem dies
 kalendario non semper denominetur a prima feria, non

1 Notandum igitur] Nota B; Notandum C inveniuntur] om A
 2 sicut] ut B 2-3 dies ante festum] dies qui ante festum
 invenitur B; dies qui ante festum inveniuntur C 3
 terminantur huius numeri] terminatur talis numerus B 3-
 4 appellantur termini] appellatur terminus BC 4 autem
 regula] quidem regula Acc; quedam regula U; regula C
 5 hoc] hoc est A 6 vel] ut C 7 quia] om B xiiii] xl A
 8 set] vel Ba dies] om C 9 prima] in prima AC feria]
 feria. pascha non deberet esse in prima feria A; vero
 deberet esse in prima feria cc; et pascha semper deberet
 esse in prima feria U potuerunt] possunt C 10 Cum
 terminus iterum] Item cum terminus BC 11 magis accedens]
 secundum quod magis accedit BC 15] in 15 U die] die
 eiusdem lunationis AU 13 habeant certa loca] habent
 certum locum cc 13-14 hec est causa] hoc est enim A; hec
 est ratio BC 14 pascha] sumamus pascha quod BC sicut
 cetera festa mobilia] quemadmodum et alia A; quemadmodum
 cetera U; om BC semper] quod semper B habet] habebit C
 15 dominica] dominica sicut cuncta festa mobilia BC
 16 prima feria] die dominica AU non] om C

potuit Pascha nec cetera festa mobilia habere certum
 U81r locum in kalendario. / Quidam iterum dicunt quod
 Dominus passus est 10 kalendas Aprilis, quia ibi fecit
 Adam, sicut dicit Theophilus Alexandrie episcopus. Dicunt
 C39va 5 enim quod voluit pati eodem die pro primo homine /
 et suo genere redimendo quo die primum hominem formavit.
 Alii sicut Jeronimus dicunt quod 8 kalendas Aprilis
 A115vb passus est Dominus, quia / ibi sumpsit carnem de
 Virgine, et in eadem carne pro homine redimendo passus
 10 est, cum secundum divinitatem pati non posset. Preceptum
 cc333rb / autem erat in veteri testamento agnum paschalem
 U82r im/molari ad vesperum post 14 diem lunationis
 Aprilis, hoc est in principio xvⁱ diei eiusdem lunationis.
 Ba26rb Ita Dominus qui verus est agnus, et /

15

1 potuit] potuerunt B; potuerit C nec] et B 1-2 certum
 locum in kalendario] certitudinem. id est. certum diem B;
 certum diem C 2 Quidam iterum] Item quidam BC; Quidem
 autem A; Quidam U dicunt] credunt U 3 aprilis] martis A
 fecit] fecit deus B 4 theophilus alexandrie episcopus]
 alexander episcopus A; theophilus alexandrinus episcopus
 B; tehophilus alexandrie episcopus C dicunt] dicitur B
 5 quod] quod deus b; quod dominus C eodem] eo B
 6 genere] om U quo] qua C 7 alii] alii vero dicunt AU
 sicut] ut C dicunt] docuunt Acc; om C 8 quia] qui B
 9 virgine] beata virgine maria A; beata virgine U
 10 divinitatem] deitatem AU 10-11 Preceptum autem erat]
 Preceptum nam erat A; Item preceptum est BC 12 immolare]
 immolarem immolare A diem lunationis] lunationes Ba
 13 hoc est] id est BC

1 Cf. Bedae D.T.R. lxvi. 4 Ps-Hieronimi,
Martyrologium (PL XXX) 449. 8 Cf. Exodus 12, 5-6.

per illum figuratum passus est in plenilunio, ut sicut eo
tempore lumen copiosius nocti attribuitur, ita per
passionem suam humane nature gratia redemptionis plenius
exhibetur. Cum igitur lunationes Aprilis quandoque sint
5 prius, quandoque posterius, non potuit Pascha in certo
loco assignari in kalendario. Est autem infimum Pascha xi°
U82v kalendas Aprilis, / quod sic patet: infima enim lunatio
aprilis incipit 8 idus martis, ubi assignatur extra 16
pro aureo numero. Lunationes enim due proximo precedentes
10 sunt embolismales, due relique illas sunt lunationes
martis, licet posterior illarum duarum terminetur primo
die Aprilis, quod contingit per quartum embolismum. Si
igitur a prima lunatione Aprilis que est contra octavum
15 idus Martis computentur 14 dies, ibi erat primus terminus
paschalis; erit xii kalendas Aprilis, et bene potest
contingere mediante variatione litterarum dominicalium
quod Pas/cha celebretur in crastino
U83r illius termini, scilicet xi kalendas Aprilis. Unde ibi

1 illum agnum figuratum] illum significatus Acc; illum
figuratus U; illum figuratur BC plenilunio] plenissimo
vel plenilunio U ut] vel B eo] in eo BC 3 suam] om BC
plenius om A 4 exhibetur] exhiberetur C igitur] ergo BC
5 in] om BU 6 assignari] celebrari A autem] igitur AU
7 enim] om C 8 incipit] incipiat C assignatur]
assignantur BaU 9 extra] om AccC aureo] aureo qualis B
10 due] due vero C relique] illam A illas] illos
embolismos B; illas embolismales C 11 lunationes]
lunationes communes cc 12 primo] in prima U quartum]
unum C 13 igitur] ergo BC; autem U 14 ibi erat] om AU;
ibi erit BC 15 paschalis] paschalis AU xii] xiii A
ante xii B; scilicet xii C et] quod U 16 variatione] om
A 17 celebretur] celebratur AccC; celebrabitur U in] om
U crastino] ultimo Acc

solet notari primum Pascha, scilicet imfimum. Ex
predictis etiam patet quod bene datur hec regula. Unde
versus:

Post nonas Martis ubi primum Pascha prima notatur,

5 Bis septem completo dies ut Pascha sequatur.

Omnes etiam lunationes Aprilis incipiunt post nonas

Ba26va Martis. Quod autem ultimum pascha / celebretur

U83v vii kalendas maii sic patet: nam ultima luna/tio

Aprilis signatur contra nonas Aprilis, ubi aureus numerus

10 est extra octo, licet illa lunatio ultima terminetur

tercia die Maii sicut sua precedens secundo die Maii,

quod contingit propter tercium et septimum embolismum. Si

igitur ab ultima lunatione Aprilis iam dicta computentur

All6ra / 14 dies, erit ultimus terminus pasche 14

15 kalendas maii, et potest contingere mediante variatione

litterarum dominicalium quod ille terminus sit dies

U84r dominicus, et dies Pa/sche celebretur sequenti die

cc333va dominica, / hoc est vii° kalendas Maii. /

C39vb

1 notari] annotari B scilicet] vel B; sice U
2 predictis] supradictis BC etiam] om AU hec] ita U 2-
3 unde versus] om AU 4 pascha] om U prima] om A 4-
5 ubi primum ... pascha sequatur] que sit nova luna
requiras. Que postquam fuerit bis septima pascha patebit
BC 5 sequatur] U add vel sic. post martis nonas ubi sit
nova luna erit ferias atque dies domini tercius pascha fiet
6 Etiam] enim AccU; om BC etiam Ba; omnes enim AccU
aprilis] om U 7 Quod] Quare BC 8 nam] om BC
9 signatur] significatur contra C; assignatur circa U
10 octo] 4 A terminetur] terminatur C 11 tercius] tercius
B sua] suum C secundo] secunda C 12 septimum] ultimum
B 13 igitur] ergo BC ab] sub Ba iam] om cc
computentur] computantur B 16 litterarum dominicalium]
litera dominica B terminus] numerus Ba dies] om U
17 et] unde AU celebretur] celebrabitur in AccU 18 hoc]
hec B

Ex hiis patet quod in illis quinque diebus dominicalibus,
sive prius sive posterius, qui sunt inter xi^m kalendas et
septimum kalendas Maii semper habet Pascha celebrari.

Unde versus:

5 Pascha nec undenas Aprilios ante kalendas,
Nec post septenas Maii valet esse kalendas.

Ad habendum autem quinque festa mobilia inventi sunt
quidam numeri qui claves dicuntur, quia sicut per clavem
fit introitus in atrium, ita per istos numeros habetur

U84v 10 noticia / festorum. Set cum in ciclo decennovenali
sint 19 anni, unusquisque suam habebit clavem. Primus 26
habet pro clave, a qua formantur claves sequentes per
additionem 19, hoc tamen prenotato quod si excrescant 40
vel maior numerus, reiciantur 30, et residuum erit claves

Ba26vb 15 subsequens; vel sic formantur secundum hos

versus:

Si vicena venit ac prima minor ne sequenti,
Hinc pro clave monos addito bis que novem;
Undenas tollas si sit vicena secunda,

20

1 Ex] Et ex BC illis] istis Acc; hiis BC quinque dies
dominicalibus] 35 diebus AUC; xxv B 2 qui] que CU
3 habet] habent C 5 aprilios] aprileos Acc; aprilis BC
6 valet] solet BC 7 Ad habendum autem] Item ad habendum
BC 8 qui] que U dicuntur] dictum est B quia] quoniam
BC 9 atrium] domum BC istos] illos U 9-10 habetur
noticia festorum] in noticiam festorum mobilium AU
11 sint] sunt U Primus] Primus annus BC; primus igitur]
AU 12 clave] clave per additionem vii BC claves] omnes
claves BC sequentes] subsequentes BC 13 hoc] set U
14 erit] om C 15 subsequens] om U secundum] per U
17 ac] a A 18 hinc] hoc B que] quoque U

Vel maior remanens proxima clavis erit.

U85r Vel possunt formari claves proposita aliqua cla/ve:
prima vel alia super illum numerum clavis computetur per
omnes iuncturas et summitates digitorum unius manus, et
5 numerus ultimus est clavis, hoc tamen notato quod si in
hac computatione proveniant 40 dicatur 10, et procedatur
naturaliter numerando, et ultimus est clavis. Si autem ex
B74v a/brupto queratur clavis alicuius anni sciatur
versibus istis:

10 Vicenos quinos, tredecim plus asse tricenis,

Unde viginti epta digitis pro clavibus apta.

U85v Computetur etiam per omnes summitates unius / manus
digitorum donec venias ad annum cicli de quo queritur,
sumpto inicio a summitate pollicis, et si annus quesitus
15 sistat in summitate pollicis, numero illius anni adde 25,
A116rb si / in summitate indicis tresdecim, si in
summitate medii digiti 31, si in summitate medici 19, si
in summitate auricularis 7; et manifeste claves

1 remanens] om B; numerus C 2 possunt formari] sicut
formantur B claves] omnes claves BC aliqua] om BC
3 computetur] om C 4 et summitates] in summitate BC
5 est] erit AccU tamen] etiam AUB; om C in] om U
6 proveniant] provenit B; proveniunt U dicatur 10] xl
reiciantur xxx vel dicatur B; recessentur xxx vel dicitur
x C procedatur] proceditur B 7 numerando] computando AU
ultimus] ultimus numerus AUC est] erit AU clavis]
clavis sequens BC 8 sciatur] scitur U 9 istis] hiis
AccUC 11 unde viginti] vigni A; viginti epta [lacuna] C
12 computetur] computentur C etiam] autem AU; enim ccBC
13 donec] usque donec B venias] veniat AC; venit B
queritur] queris C 15 sistat] sit B; consistat C anni]
anno Ba 16 tresdecim] adde 17 U digiti] om BC
18 manifeste] manifeste sunt B; manifestate sic C

manifestantur, et versus predicti, hoc etiam notato, quod
cc333vb si excrescant 40 etc. Loca clavium /possunt haberi per hos
versus:

U86r In Iano / prima, supremaque / Marte secunda.

C40ra 5 Aprilis tertia G monstrat, et ultima claves.

Ba27ra / Habitis ergo clave et loco clavis, si festa
mobilia velis scire in aliquo anno, sumatur clavis illius
anni, et ad habendum septuagesimam tot dies computentur a
loco clavis septuagesime quot unitates clavis continet,

U86v 10 et dies / ubi terminatur computatio talis dicitur
terminus septuagesime, et proxima die dominica sequente
erit septuagesima. Similiter fit de omnibus aliis
mobilibus, hoc tamen prenotato quod ad habendum
septuagesimam vel quadragesimam in anno bisextili oportet
15 addere unitatem clavi; aliter enim contingeret quandoque
septuagesimam vel quadragesimam per claves prius

1 manifestantur et] quod etiam manifestant BC versus
predicti] in versibus dictis A; hii versus B 1-2 hoc
etiam ... 40 etc] Pollice vicenos cum quinque. et indice
denos. Cum tribus monos mediate redde tricenos. Tercia da
medici cum denis. auriculari septem. de xlta decies tria
feria B; om C 2 Loca] loca autem AU; Item loca BC
possunt haberi] habentur BC 4 supremaque] suprema Ba
5 claves] B adds scilicet septuagesime quadragesime pasce
rogationum pentecos. redde signa singulis sic per
ordinem. scilicet. prius .G. iani. septuagesima.
suppositum quadra. secundum G martis pasce. tercius
aprilis. rogationibus et ultimum eiusdem pentecos. Est
ergo G locum cuiuslibet clavis; C adds Ait ergo G littera
locus cuiuslibet clavis. 6 habitis] habito A ergo]
igitur AU clavis] om C 7 velis] vis BC aliquo]
quolibet BC illius] eiusdem BC et] om AU
9 septuagesime] om C 11 proxima] proximo BC die] dies A
12 erit] om U Similiter fit] Similiter faciendum est AU;
similiter fac ccB; sic fac C aliis] hiis B 13 mobilibus]
festis mobilibus AUBC tamen] autem C; etiam U quod] om
C vel] et AUBC 15 enim] etiam cc

celebrari quam deberet viii diebus. Per hos etiam versus
potest sciri terminus Septuagesime et per consequens
cetera festa mobilia:

A festa stelle numerando perfice lune

5 Quadraginta dies et Septuagesima fiet.

Si cadat in lucem Domini suppone sequentem,

Si sit bisextus lux additur una diebus.

U87r

Si cadat in fe/riam septenam fit que bisextus,

Linque diem primum Domini retinendo secundum.

10 A principio igitur illius lunationis in qua est
Epiphania, que proprie dicitur festum stelle, sive illa
sit in Ianuario sive in Decembri, computentur 40
descendendo, et 40^{us} dies est terminus Septuagesime, et
proxima die dominica sequenti erit Septuagesima. Si sit

Ba27rb 15 bisextus addatur unus / dies, sicut manifestant
predicti versus. Ad habendum terminum Pasche sciantur hii
versus:

Esse gravem nobis bello karnem kanomius,

1 viii] 7 U Per hos versus etiam] Item per hos versus
BC; Per hos versus autem U 3 cetera festa mobilia]
cetera festa Ba; ceterorum mobilium festorum B
5 Quadraginta] xx C 6 sequentem] sequentem .scilicet.
dominica B 7 Si sit bisextus lux additur una diebus] om
CU 8 fit] sit UC domini] [lacuna A] 9 Linque diem ...
retinendo secundum om C retinendo secundum] suppone
sequentem U 10-11 in qua est epiphania] om A 11 illa]
om B 12 sit] fuerit A in] om cc computentur]
computantur C 40] 30 A; xl dies B 13 40us] 240 A
14 proxima] proximus C die] om B sequenti] sequente BC;
om U 15 unus] una B manifestant] patent U
16 habendum] habendum autem AccU hii] isti A 18 karnem
kanomius] carnem ca[.]amus A; carnem caveamus U; lacuna
cc; carnem kareamus B; turbam caveamus C

U87v Bellum sepe gerens et enim puto deicit hostem,
/ Mox anime lucrum invenies cum religiosis.

In hiis versibus sunt 19 dictiones servientes 19 annis
cicli decennovenalis, prima primo, secunda secundo et sic
cc334ra 5 deinceps. Si igitur alicuius / anni cicli
A116va decennovenalis / terminum velis invenire
paschalem, sumatur dictio serviens illi anno, et si illa
terminatur in M, terminus Pasche erit in Marcio tot
diebus computatis a fine Martis ascendendo quota est
10 prima littera illius dictionis in alphabeto, et ubi
C40rb terminatur talis computatio, ibi est / terminus
Pasche. Si autem non terminetur in M, terminus paschalis
erit in Aprili tot diebus computatis a principio Aprilis
descendendo quota est prima littera eiusdem dictionis in
15 abecedario.

In gravibus causis hastam gerit improbus hostis,
Laudatur iustus, gladio caret hoste gravatus,
Crudeles homines fur incitat hoste karente.

1 gerens] gens Ba puto] pure A; puro cc 2 mox anime
lucrum invenies cum religiosis] om A invenies] invenes B
3 hiis] isti U 4 sic] ita CU 5 igitur] ergo BC
6 decennovenalis] om U terminum velis invenire] vis
scire terminum BC 7 serviens illo anno] illus anni
serviens ei B 8 pasche] paschalis U erit] om A 9 quota
est] om A 10 illius] eiusdem BC in alphabeto] quota est
in alphabeto quota est A 11 terminetur] terminatur AUB
12 M] M litera tunc BC paschalis] pasche U 13 erit] est
BC in aprili] aprilis Acc 14 eiusdem] illius Acc
15 abecedario] alphabeto que debet servire illo anno BC;
alphabeto AU 16 causis] luis C hastam] hasta BaB
improbus] probet cc; improbet B 17 gravatus] lacuna cc
18 karente] lacuna cc; karentes AUBC

U88r Per hos etiam versus scitur quot sep/timane sunt
 inter dominicam proximam, sive ante sive post natale
 Domini et Quadragesimam. In hiis versibus sunt 19
 dictiones servientes 19 annis cicli decennovenalis, prima
 Ba27vb 5 primo, secunda / secundo et sic deinceps. Si
 velis igitur in aliquo anno cicli scire quot septimane
 sunt inter dictam dominicam et Quadragesimam, vide quota
 sit littera prima dictionis servientis illi anno in
 alphabeto et tot erunt septimane in tempore quesito.
 10 Sequitur de lustris, indictione, seculo et evo.
 U88v / Est autem / lustrum spacium quinque annorum a
 B75r Romanis consideratum ad tempus dictaturarum, et dicitur a
 lustro, lustras, quia in fine quinquennii in principio
 alicuius dictature circuebant civitatem cum cereis et
 15 candelis. Indictio est spacium 15 annorum, et dicitur ab
 indico, indicis. Cum enim Romani fere dominantur in
 universis nationibus terras fecerunt tributarios,

1-3 per hos ... et quadragesimam] appears before versus
in AUBC 1 per hos etiam] per hos autem AU; Item per hos
 B; vel per hos C 2 proximam] om A 5 secunda secundo] om
 AccC sic] ita U 6 velis igitur] ergo velis B; ergo vis
 C scire] scire in quo anno cicli xixlis B 9 quesito] B
adds Capitulum 15 de lustris etc 10 sequitur de lustris
 indictione seculo et evo] om U 12 dictaturarum]
 dictaturarum U; B adds Dictatura est quedam dignitas
 dicitur] dicitur lustrum B 13 lustras] tras ccU; as B;
 tras C quinquennii] quinquenni cuiuslibet et A;
 cuiuslibet et U in] et in BC 14 alicuius] om AU
 circuibant] circuebant Ba; circuebant C civitatem]
 civitatem romani A cum] om C 10 candelis] AUBC add [et
 AU] adhuc ecclesia memorat [de hoc U] lustrum [lustra A]
 dicens lustra sex [qui A; que C] etc 15 Indictio] Item
 indictio C annorum] om A 16 indicis] cis ABC fere] om
 U in] om AccUB 17 fecerunt] fecerunt sibi AUBC
 tributarias] tributarios Ba

percipientes ut terre remotiores propter difficultatem
 A116vb transitus in fine primi / quinquennii persolverent
 aurum ad dominationis typum, in fine secundi quinquennii
 U89r argentum / ad stipendia militum, / in fine
 cc334rb 5 tercii quinquennii es et ferrum reparationem armorum;
 unde a quibusdam indicio dicitur erea ab ere propter es
 solutum in tercio quinquennio. Unde instituerunt Romani
 quod nullum privilegium, nulla conventio scripto
 commendata esset stabilis nec firma nisi haberet
 Ba27vb 10 indictionem annotatam, et / hoc ne tributorum
 solvendorum memoria laberetur. Nos vero in tribus utimur
 U89v indictione, in privilegio, in cereo pascha/li, in
 dedicationibus ecclesiarum. Incipit autem ciclus
 indictionum in septembri, quia cum tunc sit ubertas
 15 fructuum posset bene solui tributum. Si vero placet scire
 C40a in quoto anno indictionis / sumus, annis Domini
 adde 3, quia dominus dicitur natus in 4 anno indictionis,

1 percipientes] precipientes B 2 primi] om BC
 5 reparationem armorum] ymagines et arma reparanda BC
 6 erea] ersa C 7 quinquennio] anno A 8 nulla] nulla
 etiam A; nec ulla B; et nulla C conventio] conventio
 etiam U 9 nec] et BC 10 ne] om C solvendorum]
 persolvendorum Acc; solvendorum in quinquennio BC vero]
 autem AUBC tribus] tribus locis BC 12 indictione]
 indictione scilicet B privilegio] privilegiis Acc in]
 et in AccB 13 autem] quidem AccU 14 indictionum]
 indictionis BC 15 posset] potest B bene] tunc bene U
 vero] autem AccU placet] placead A; vis BC; velis U 16
 indictionis] cicli indictionis C sumus] simus AccU
 17 3] quarto C dicitur natus] dicitur natus fuisse AccU;
 natus est BC 4^{to}] 3 Ba

U90r

et totum divide per 15. Si nichil est residuum, tunc sumus
in ultimo anno indictionis. Si aliquid, ostendet in quoto
anno sumus. Et notandum quod indictio est equivocum
ad / denominandum spacium 15 annorum et ad quodlibet
5 spacium illius spacii sive cicli. Seculum dicitur spacium
centum annorum, unde multa preteriere secula. Seculum
autem dicitur mundus et tota machina mundana cum suis
contentis. Evum vero a comptista dicitur spacium mille
annorum. Dicitur etiam evum idem quod etas, unde homo
10 magni evi, id est magne etatis. Et dicitur evum idem quod
mora. Unde Boetius:

Qui tempus ab evo ire iubes.

Explicit comptus.

1 divide] dividatur BC per 15] per sex cc 2 indictionis]
om BC ostendet] tunc illuc ostendet nobis A; ostendit cc
tunc nobis illud ostendit U; illud ostendit BC 3 Et
notandum] Set nota BC 4 denominandum] denotandum AccU;
nominandum BC ad] om Acc; ad nominandum BC 4-5
quodlibet spacium illius] quodlibet annum illius spacii
A; quemlibet annum illius spacii sive cicli cc; quemlibet
annum illius B; quodlibet annum illius spacii C 5 sive
cicli] om A 7 autem] etiam AB 8 vero] om BCU 9 etiam]
enim BC 10 magni evi] magnevi A id est magne] sive BC
et] om BC 12 iubes] AU add stabilique manens dans omnia
[cuncta U] moveri 13 Explicit comptus] om A; A adds
mitto tibi frontem veneris zonamque diane atque capud
liaris cum pede leucotie augurui [A riddle giving vale];
Explicit liber qui vocatur comptus quod hatfeld U;
Explicit comptus magistri roberti Grosseteste B

10 Boethii, De consolatione philosophiae III, IX.

COMPOTUS ECCLESIASTICUS

COMMENTARY

pp.190-1 INTRODUCTION.

The subject-matter of computus is defined, and distinguished from that of astronomy and astrology.

1-2 Computus est scientia considerans tempora distincta secundum motum solis et lune] Of the earlier computists Faith Wallis has observed: "Writers of computus treatises are not much given to dictionary definitions of their craft",¹ but definitions of this kind became common when computus became a Quadrivium subject. Gillian Evans found the same "fondness for definition" amongst the algorists:² it was part of the Schools apparatus, the accessus, which has been discussed above.³

Cf. Digby 40 fol 22v:

Computus est scientia distinctionis temporum secundum motum duorum principalium planetarum, solis videlicet et lune.

Cot.Vit.A XII fol 87rv:

¹F.Wallis, MS Oxford St John's 17: a medieval MS in its context p.707.

²G.R.Evans, "From Abacus to Algorism: theory and practice in medieval arithmetic", British Journal for the History of Science 10 (1977), 120.

³See pp.40-41.

Compotus est scientia commensurandi tempora mediis
motibus solis et lune.

Massa compoti p.52:

Compotus est scientia distinguendi tempus certa
ratione.

The quotation from Genesis links compotus with Hexaemeral literature, and establishes the study firmly in a Scriptural framework.⁴

pp.191-2 THE PARTS OF TIME.

The Compotist begins his treatise by introducing us to the units of time:

The parts of time larger than the day are the week, the month, the year, the lustrum, the indiction, the century and the age. What each of these is will appear well enough later on. The parts less than the day are the quarter, the hour, the moment, the uncia and the atom. The quarter is a fourth part of the natural day, i.e., 6 hours; the hour is a 24th part of the natural day; the moment is a 40th part of an hour; the atom is a 47th part of an uncia.

⁴See above, pp.2-3.

The computist selects from among the smaller units of time only those that are relevant to the calculations in his treatise. The quarter or quadrans is important for the bissextile reckoning. Apart from this, he leaves us with the following scheme:

47 atoms = 1 uncia

12 uncie = 1 moment

40 moments = 1 hour

It is not as odd as it looks. The uncia (modern ounce) points us to the Roman duodecimal system, which developed originally as a way of measuring weight, one as or pound being the equivalent of 12 ounces.⁵ Each intervening duodecimal fraction (from 2/12 to 11/12) is separately named. The full list of the duodecimal fractions can be found in Chapter 4 of Bede's De temporum ratione. This is entitled De ratione unciarum, and it often occurs as a separate treatise. If we bear these fractions in mind, we shall see that the values given to the uncia and the moment are less arbitrary than they at first appear. The uncia is 1/12 of the moment regarded as the whole; and the moment is 8/12 (bisse) of the hour regarded as the whole. The reason for the odd value given to the atom (1/47 uncie) will appear below.⁶

⁵There are still 12 ounces to the pound in Troy weight.

⁶pp. 386-7.

The precedent for including a discussion of the parts of time in Compoti is pre-Bedan, and had a long history after Bede: Roger of Hereford reproduced the table of fractions in his Compotus,⁷ and this compotist, similarly, defines the fractions that are used here: triens, (4/12 or 1/3), and bisse (8/12 or 2/3). The value of the atom is 1/564 moment: the intermediate unit, the uncia, appears at least as early as Helperic.⁸ It makes the calculation for the saltus lune⁹ less unwieldy.

Chapter 3 of Bede's treatise deals with De minutissimis temporum spatiis. No doubt our compotist knew this passage; but Bede was drawing on earlier, Insular material. According to Jones, "Computi are filled with short passages treating the smaller units of time, but nearly all of them can be traced to Ireland".¹⁰ This passage can be compared with De divisionibus temporum;¹¹ the 9th century "Munich Computus";¹² and the Liber de computo.¹³ A notable example is to be found in the seventh-century treatise De ratione

⁷MS Digby 40 fol 34v.

⁸Liber de computo, PL 137 32D

⁹See pp.386ff.

¹⁰C.W.Jones, Beda's opera de temporibus p.331.

¹¹PL XC 647-664.

¹²Munich, Staatsbibliothek 14456.

¹³PL CXXIX 1345D-6C.

computandi.¹⁴ The information about the parts of time derives ultimately from Isidore of Seville, Etymologiae V. pp.192-7. THE DAY.

The "natural day" of 24 hours is distinguished from the "artificial" day which varies in length according to the time of year, a variation often recorded in calendars.¹⁵ Different peoples begin the day at different times, and give them different names.

p.192, 7-8. Notandum quod dies naturalis secundum diversos diversa habet principia] According to Bede, the day begins at sunrise for the Hebraei, Chaldaei and Persae, at midday for the Umbri and Athenienses, at sunset for the Egyptii and at midnight for the Romani. "Divine authority" sanctions sunset.¹⁶ This information is commonplace in computistical literature, and derives originally from Isidore.¹⁷

The writer of the Computus ecclesiasticus, with Conrad of

¹⁴De ratione computandi ed. Dáithí Ó Cróinín (Pont.Inst.Med.St. 1988), 123-4. Ó Cróinín's note on 123 is a valuable amplification of Jones's comment.

¹⁵Christopher Wordworth, The Ancient Kalendar of the University of Oxford (Oxford Historical Society 45, Oxford 1904), pp. 46-57, prints a calendar which shows this variation.

¹⁶DTR Cap.V, 90-94.

¹⁷See, for instance, PL XC 657; PL 129 1307. The original passage is in Isidore, Etymologiae V 30.

Strasburg and Alexander de Villa Dei, differs from Bede and other earlier compoti by attributing the midday beginning of the day to the Arabes. Where did his information come from? Conrad of Strasbourg tells us that the source was astronomical:

Incipit enim secundum astronomicos in meridie, secundum quod procedunt operationes tabularum astronomicarum.¹⁸

Like the writer of the Compotus ecclesiasticus, he attributes the sunset beginning to the Hebrews or Jews:

Secundum hebreos vero incipit dies in principio noctis, unde in ieiuniis suis abstinent usque ad stelle visionem.

The same information is to be found in the Massa compoti of Alexander de Villa Dei (astra sequentes means "astronomers"):

Lux naturalis viginti quatuor horis
constat et a variis diversa exordia sumit;
mane diem graeca gens incipit, astra sequentes
in medio lucis, Judaeus vespere, Sancta
inchoat Ecclesia medio sub tempore noctis.¹⁹

¹⁸Bruges MS 528 fol.2r.

¹⁹Le Nombre d'Or, p.54.

The information derives ultimately from Ptolemy, whose Almagest was known at first only through Arabic commentators. Van Wijk refers us to Alfarganus and Albirûni.²⁰ Its occurrence here is interesting evidence of the dissemination of Ptolemaic ideas through Arab intermediaries before their reception in Latin translation. Gerard of Cremona's version of the Almagest of Ptolemy dates from 1175, although this was not the first to appear in Latin.²¹ The reference here is an indication that both the Computus ecclesiasticus and the Massa compoti are more innovative than they might seem at first sight.

p.193, 8-10 Philosophi enim denominant quamlibet diem septimane ab illo planeta qui dominatur in prima hora illius diei] This astronomical explanation of the names of the days does not appear in the De temporum ratione. It appears to originate in the Roman History of Dion Cassius. Jones remarks that it is contained in a "wholly astrological" treatise printed by Migne under the title Ordo planetarum.²² It seems generally to have been preferred to Bede's explanation: compare Honorius, Imago mundi p.99; Cot.Vit.A XII fol 88ra; Digby 40 fol 25v; Bruges 528 2r.

²⁰Le Nombre d'Or p.95.

²¹See Haskins, Studies, p.104-5.

²²PL 90, 943-6; see C.W.Jones, Bedaes pseudepigrapha p.86.

A gloss on this passage which is to be found in the extended copy of the Computus ecclesiasticus in Camb.Univ.MS Pemb.278 fol 27r suggests that its copyist was English :

Rursus gens germanie secundum linguam suam dis quos coluerunt nomina dierum dederunt, vocantes primam diem Sunesday, secundum monesday, terciam nomine martis secundum linguam suam tyssesday, quartam wodenesday qui et mercurius dicitur, quinta iovi qui proprium dixerunt tonitrum pundrisday, sexta quidem dee friee nomine unde dicitur freyday, septimam saturno scilicet saterday. Vel secundum quosdam incipiunt ut supra a saterday, et huiusmodo adhuc utuntur Teutonici et angli more gentilium.

I can find no source for this passage, but it appears to be modelled on Bede's account of the names of the English months.²³

14 Cinthia, Mercurius, Venus et sol. Mars, Iove, Satur]
thus also Massa compoti, p.54.

p.194, 11 Quidam medici cum dant potiones] One of the few medical references in the Computus ecclesiasticus. It is Faith Wallis's contention that medical texts were an

²³DTR pp.211-213: De mensibus anglorum.

integral part of earlier computistical collections,²⁴ although the study of medicine was more closely related to astrology than compotus.

p.195, 11-12 primam diem septimane appellaverunt diem dominicum] The authors quoted are Bede and Jerome; but the passage seems to owe something to the "Sunday Lists", which enumerated "notable scriptural events which occurred, or are said to have occurred, on Sunday". Material of this kind is to be found in Irish sources, and earlier in Isidore.²⁵ A similar passage is to be found in the Compotus of Gerland.²⁶

pp.197-198 THE WEEK.

Unlike the days of the week, the weeks themselves have no special names, because there are too many of them, and because they are not contained neatly within the year.

The passage is based on DTR Chapter VIII.

p.197,16 Ebdomada dicitur ab ebda] The derivation is ultimately from Isidore, Etymologiae V xxxi.

²⁴Faith Wallis, MS Oxford St John's 17: a Medieval MS in its Context (Ph.D.Thesis, Toronto 1985), p.158.

²⁵See C.L.Lees, "The Sunday Letter and the Sunday Lists", Anglo-Saxon England 14 (1985), 129-151.

²⁶Digby 56 fol 174v: Eadem quoque die incepit seculum, eadem filii israel transierunt mare rubem liberati a pharaone

Romulus established a year of 10 months. Numa Pompilius added January and February. Julius Caesar made the ultimate correction to the year, bringing it up to 365¼ days. The writer notes that the Julian Year is 8 moments too long, a subject which he will return to later.

The information about the Roman months is to be found in Bede, De temporum ratione cap. xii: De mensibus romanorum. Bede's material is from Macrobius, Saturnalia I, 12,13,14,²⁷ and the Etymologiae and the De natura rerum of Isidore. As has already been said, the derivation of Februarius from febris is not in Bede, but could be a misunderstanding of Isidore.²⁸ Similar material is to be found in Helperic,²⁹ Gerland,³⁰ Honorius,³¹ Constabularius,³² Roger of Hereford³³ and Magister William.³⁴

²⁷See C.W.Jones, "The lost Sirmund Manuscript of Bede's Computus", EHR 52 (1937), 211.

²⁸See pp.156-7.

²⁹Liber de computo, PL 137 28D-29A.

³⁰Digby 56 fol 171v

³¹De imago mundi p.100-3

³²Cot.Vit.A xii fols 86va-87vb.

³³Digby 40 fol 24v

³⁴Digby 56 fols 212vb-213ra

The quotations from Ovid appear to be an innovation, of which Alexander de Villa Dei disapproved.³⁵ All the cited passages are from Book I of the Fasti, which might imply a rather limited knowledge of the poet. The explanation that Romulus made his year ten months long because of the length of a woman's pregnancy is from Fasti, I 31-36. It is interesting that Roger of Hereford has this detail.³⁶ I have found it in no earlier Computus. It is not in Constabularius, although he, too, appears to have known this text, since he takes a remark about coins from the same book.³⁷

pp.201-4 THE SIGNS OF THE ZODIAC.

As the sun journeys through the 12 signs of the zodiac, the characteristics of each one are reflected in conditions on the earth.

The writer has told us at the beginning of his treatise that the art of computus is concerned only with the movements of sun and moon. This section therefore is

³⁵See above, p.127.

³⁶Digby 40 fol.24v: Romulus vero primus romanorum annum constituens secundum numerum mulieris pregnatis .x. menses initio sumpto a marcio ordinavit.

³⁷Cot.Vit.A.XII fol.88vb: Set et nummismati ex una parte inscribatur imago biceps ad honorem iani ex alia navis in memoriam fuge saturni. (The source is Ovid, Fasti I 229-30). Constabularius explains that Romulus ordained the ten-month year "ob multiplicem denarii dignitatem" (fol 88va).

strictly irrelevant to the subject; but as Jones observed, "The zodiac and planets fascinated early medieval students, and computi are filled with notes about them".³⁸ Valerie Flint draws attention to the fact that contact with Arab learning brought a renewed interest in astrology.³⁹ Bede dealt with the topic in Chapter XVI of the De temporum ratione, quoting Ausonius, but the Computus ecclesiasticus contains a great deal of extra detail, the source of some of which I have not been able to trace. According to Jones, the material derives ultimately from a few works, "primarily Macrobius's Saturnalia and In somnium Scipionis, Hyginus, the Aratea, and Martianus Capella".

p.201, 17-19 Est Aries, Taurus....] Cf. Massa compoti p.55, which has urna qui tenet for amphora, i.e., Aquarius.

201-202,1 dicant Arabes quod sol factus est in leone] I have found this statement in no other computistical work, nor have I been able to trace it to an Arab source. But the statement, which is repeated on p.21, does appear in the Ordo planetarum referred to above:

"Sol creatus est in Leonis Et haec sententia universorum Aegyptiorum".⁴⁰

³⁸Beda's opera de temporibus p.351.

³⁹V.I.J. Flint, "The transmission of astrology in the early Middle Ages", Viator 21 (1990), 8.

⁴⁰PL 90, 944D-945A.

It is the lion which is more usually credited with being strong at the front and weak at the back.⁴¹

p.102, 16 sicut gemini depinguntur iuvenes amplectentes se]

This detail appears to have a non-verbal source, since this is the usual illustration for this sign.

pp.204-206 KALENDS, NONES AND IDES.

The days of the month are identified by their relationship with the Kalends, Nones and Ides. The derivation of these names and the reason for the use of the word pridie for the day before each is explained.

The writer adds some apposite quotations from Ovid and two straightforward mnemonics. The passage may be compared with Chapter 13 of the De temporum ratione which is based on the Saturnalia I, 15, 9-13. Similar passages occur in most computi.⁴² Conrad of Strasbourg has the same quotation from Ovid about the Kalends.⁴³

p. 205, 7-8 in prima die mensis mutuo solebant dari quedam dona ab amicis] Cf Ovid, Fasti I 175:

⁴¹See, for instance, Helperic, Liber de computo, PL 137 24C.

⁴²Cf. Gerland, Digby 56 175r; Honorius, Imago mundi p.104; Cot.Vit.A XII fols 88rb-va; Digby 40 25r-26r; Master William, Digby 56 fols 212rb-va.

⁴³Bruges MS 528 fol 1v.

ac cur laeta tuis dicuntur verba kalendis,
et damus alternas accipimusque preces?

pp. 207-8 EGYPTIAN DAYS.

Two days in every month are said to be unlucky. They are connected with the Ten Plagues of Egypt: two MS of the Compotus ecclesiasticus contain a mnemonic which recalls these.⁴⁴ Despite their prohibition by S. Augustine, instructions are given for finding them in the Calendar.

S. Augustine's condemnation of the observation of Egyptian Days, in his commentary on Gal.4,11, is explicit:

Dies observatis, et menses, et tempora, et annos. Iam vero ne aliquid inchoetur, aut aedificorum, aut huiusmodi quorumlibet operum, diebus quos Aegyptiacos vocant, saepe etiam nos monere non dubitant, nescientes, ut dicitur, ubi ambulant.⁴⁵

It is not surprising that Bede had nothing to say on this topic. The Egyptian Days had been the occasion for human

⁴⁴Ashm.1285 fol 109ra; Univ 26 fol 37r.

⁴⁵S. Augustine Epistolae ad Galatas expositionis liber unus (PL 35 2130), commenting on Gal.4,11. The best treatment of the subject is still R.R.Steele, "Dies Egyptiaci", Proceedings of the Royal Society of Medicine 13 (1919), 109-121.

sacrifice, our computist tells us:⁴⁶ Bede contemplated even animal sacrifice with horror:

Blodmonath mensis immolatum quod in eo pecora quae occisuri erant diis suis voverent. Gratias tibi, bone Iesu, qui nos ab his vanis avertens tibi sacrificia laudis offerre donasti.⁴⁷

Solomon Ganz suggested that the Egyptian Days were originally the epagomenal days, which according to Job, have an unlucky character:

As for that night, let darkness seize upon it; let it not be joined unto the days of the year, let it not come into the number of the months (Job, 3, 6).⁴⁸

Despite ecclesiastical disapproval, the days continued to be marked in the calendar, although they had, as John Henig remarks, no computistical significance.⁴⁹ They are described in short treatises like the De tribus diebus periculosis,⁵⁰ and the existence of the sort of verses

⁴⁶p.18: Quidam etiam in hiis diebus sacrificabant humanum sanguinem.

⁴⁷DTR p.213.

⁴⁸Solomon Ganz, "The calendar of ancient Israel", Homenage a Millas-Vallicroza I (Barcelona 1954),638n.

⁴⁹John Henig, "Versus de mensibus", Traditio 11 (1955), 82.

⁵⁰PL 90, 955.

which are recorded in the Compotus ecclesiasticus is evidence that they were well-known; but accounts of them do not appear to have been included in computistical treatises until the twelfth century. They are to be found then in the Imago mundi of Honorius.⁵¹ Roger of Hereford describes their position in the calendar, but makes no further comment except that they were invented by the Egyptians.⁵² There seems to have been some uncertainty about the placing of the unlucky days: a warning that this is no longer accurate is given in the Compoti of Master William,⁵³ and Conrad of Strasbourg.⁵⁴ The writer who added a commentary to the copy of the Compotus ecclesiasticus which is to be found in Camb.MS Pemb.278 held that they had originally been lucky days.⁵⁵

⁵¹Imago mundi p.123.

⁵²Digby 40 fol 26r: Quarta linea continet dies egiptiacos quia ab egiptiis inventi.

⁵³Digby 56 fol.213ra: Sciendum est quod in quolibet mense sunt duo dies qui egiptii vocantur sive dies mali; egiptii quia ab egiptiis inventi sunt. Egiptii comperientes quod in illis diebus non erat bonum minuere, vel aliquid aliud opus facere notaverunt illos. Set notandum est quod sunt modo observandi secundum quod notabantur ab illis tunc, nec et solstitia, nec et equinoctia nunc notatur.

⁵⁴Bruges 528 fol. 2r: Item notandum quod in quilibet mense signati sunt duo dies in kalendario qui dicitur egiptiaci ab egiptiis qui invenerunt astronomice in illis diebus quasdam horas esse nocivas operibus iniciandis, propter nocivas constellationes. Tamen istorum dierum observatio hiis diebus vana est et supersticiosa, eo quod constellationes ille nocive tum propter errorem octave spere tum propter errorem compoti nostri locum mutaverint, et quod fidem constellationibus ecclesia prohibet esse adhibendam.

⁵⁵Camb.Pemb.278 fol.29v: dicunt etiam quidam alio modo quod egiptii viventes sub aere purissimo perceperunt duos dies bene ordinatos ad aliquid inchoandum, set quia hoc est

Reference has already been made to the renewed interest in astrology that contact with Arabic science brought with it. It would be interesting to know if knowledge of the Egyptian Days was ever put to practical use.

p.208, 2-3: Augurio decies audito limite clangor linquit
olent abies coluit colus excute gallum]

The mnemonic identifies the Egyptian Days. The twelve words "serve" the twelve months, beginning from January; the initial letters of the first and second syllables of each word give the Egyptian Days, counting downwards and upwards respectively, i.e., 1,25 January; 4,26 February; 1,28 March; 10,19 April; 3,24 May; 10,15 June; 13,21 July; 1,23 August; 3,20 September; 3,21 October; 4,28 November; 7,21 December. This mnemonic appears in the Massa compoti, and in the Compotus of Conrad of Strasbourg.⁵⁶

pp.208-210 THE YEAR.

There are many different years, but the writer details only two: the solar year, which is the subject of this part of the treatise, and the lunar year which will be dealt with later. The solar year which he defines is the tropical year: the sidereal year is irrelevant to compotus, although

ex aeris dispositione sive planetarum contingere putabant, et non ex divina providentia. Unde propter eorum errorem illis in malum exitum deus pervertebat, quia creature quod creatoris erat attribuebant.

⁵⁶Massa compoti p.55; Bruges 528 fol 2r.

some other writers confuse the issue by describing it.

Like the day, the solar year may begin at different times. Numa Pompilius began the year from the winter solstice, which is thus identified as 1 January. The lines of Ovid that are quoted bear this out, which presents the writer with a difficulty, since the Church identified the winter solstice with the birth of Christ. He adds that it was not on the same day, but in the same time, a shift he has to adopt later when dealing with the beginning of the seasons. He reiterates that the Arabs say that the sun was made in the sign of Leo, so that they begin their year from the summer solstice.

In compotus it is important to know where the year begins, because it affects calculation. The concurrents and the solar regulars belong to the Alexandrian tradition, and are calculated from March; the claves and the golden number begin, like the Julian Year, from January; the epacts and lunar regulars begin in September, according to Bede, "on the authority of the Egyptians".⁵⁷

The passage is based on Chapters 6 and 36 of the De temporum ratione. The detail of the "serpent of the year" is added from Etymologiae V, 36. The extended version of the Compotus ecclesiasticus to be found in Pemb.278 gives an alternative etymology for annus: vel dicitur an ano

⁵⁷DTR p.222.

sorore didonis.⁵⁸

pp.211-217 CONCURRENTS AND SOLAR REGULARS.

Fixed dates in the calendar year occur on succeeding days of the week in following years because the solar year contains 52 weeks and one extra day (or two extra days in a leap-year). The day of the week on which a particular date in the calendar falls can be calculated if you know the concurrent (a number from 1-7 assigned to each year of the 28-year solar cycle), and the solar regular (a fixed number from 1-7 assigned to each month of the year). These when combined indicate the day of the week on which the first day of the month falls.

The parallel passage on the concurrent in the De temporum ratione is Cap.LIII: De epactis solis. An explanation of the working of the concurrent was an essential part of a treatise on Compotus. Helperic's account has the phrase septenarium non excedens which appears in our treatise,⁵⁹ although the passage as it appears in the Compotus ecclesiasticus sounds as though it has been honed in the lecture-room.

11 ut unitas numerus appelletur] It was a principle of Boethian arithmetic that "one is not a number but the

⁵⁸Pemb.278 fol.31r.

⁵⁹PL 137 27D.

source of number".⁶⁰

p. 211, 19-23,1 primus annus cicli concurrencium unitatem habuit pro concurrente] Later we shall meet the solar cycle.⁶¹ It is not the same as the cycle of concurrents, for as Gerland points out, the first year of the solar cycle has no concurrent,⁶² and as Bacon explains, the concurrent of any year is made up of the days left over from the preceding year.⁶³ Because of this, Gerland tells us, the bissextile falls in year 4 of the cycle of concurrents, not, as in the Dionisian reckoning, in the fifth.⁶⁴

p.212, 11-12 Quam feriam martis F littera significavit Illius in numero concurrens serviet anno]

A mnemonic to find the concurrent of any year. In verses of this kind numbers and letters are interchangeable. The

⁶⁰Gillian Evans, "From abacus to algorism: theory and practice in medieval arithmetic", British Journal for the History of Science 10 (1977),114.

⁶¹pp.221ff.

⁶²Digby 56 fol.171: Nam primus annus sine concurrente fuit.

⁶³Roger Bacon, Computus, p.97: concurrens alicujus anni est numerus dierum qui relinquitur ex anno precedenti.

⁶⁴Digby 56 fol 171rv: Nam primus anni sine concurrente fuit, secundus vero habuit primam concurrentem, iiii iam, iiii iamB, vus vam, vius viam, viiius viiam, viiius iamB, ixus iiii iam et deinceps donec occurrat tibi idem initium quod eveniet post xxviii concurrentes. Non igitur regulariter incedunt qui vel ita concurrentes incipi putant: iamB, ii, iii, iiii, viB; vel ita: iamB, ii, iii, vB; quia nec in secundo anno est bisextus, nec in Vto, nec transilire debemus nisi prius diem bisextilem.

"letter" is the Dominical Letter for a given year. This is the number accorded to all the Sundays in a year on the basis of the date of the first Sunday of the year. In 1990, this Sunday was 7 January: thus the Dominical Letter for 1990 was G. In 1990, therefore, F designates Saturday, and the first Saturday in March is 3 March. From G to F (GABCDEF) inclusively, counting on the fingers, there are 7 letters: so the concurrent for the year is 7.

Master William has a similar mnemonic:

f. marcius prima quota feria tibi signat
in toto numero concurrens serviet anno.⁶⁵

16 Sex habet A G quoque septem]

The Dominical Letter for 1990 was G: checking with the mnemonic, we find that the concurrent for the year was 7. As has been said above, Dominical letters belong to the Roman rather than the Alexandrian system.⁶⁶ As a result, they begin on 1 January, whereas the concurrent is reckoned from 24 March. This mnemonic links the Roman and Dionysian systems.

p.213, 2 Mutatur autem concurrens in martio] i.e., after the bissextile. This theory has been disputed, but it seems to be borne out by Constabularius, who relates the sedes concurrentium to an account of how the concurrent increases

⁶⁵Digby 56 fol 213va.

⁶⁶C.W.Jones, Bedae Pseudepigrapha p.61.

by two in the bissextile year.⁶⁷

14-15 Mundus factus est xv kalendas aprilis] i.e, three days before the spring equinox, (traditionally 21 March), the Fourth Day of Creation, on which the sun and the moon were made. Thus Bede:

Nunc admonere contenti xii kalendarum aprilium die occursum aequinoctii et ante triduum, hoc est xv kalendarum earundem, primum saeculi diem esse notandum.⁶⁸

17 Principium mundi renovat .G. tertia martis]

In the first year of Creation, a putative 3 March would have fallen on the 7th day of the week, i.e., Saturday. In this year 7 January would have been Sunday, and so the Dominical Letter is G=7. This kind of argument seemed perfectly reasonable, at least to Roger of Hereford and to Conrad of Strasbourg.⁶⁹

p.214,4 patet qua feria mensium incipiunt et ita patent

⁶⁷Cot.Vit.AXII fol.93ra.

⁶⁸DTR p.192.

⁶⁹Digby 40 fol 28v: Et licet kalendarum nostrum tunc non fuit ordinatum, potest tamen ut tunc ordinatum intelligi, quia licet non fuerit, potuit tamen fuisse, et si fuerit sic ut dicimus tunc se haberet. Bruges 528 fol 2v: Cum ergo mundus creatus sit .xv. kalendis aprilis die dominice, computatione facta rursus usque ad kalendas martii, invenies illas - si fuissent - in quintam feriam incidisse.

regulares] As has been explained above, a putative 1 March in the first year of Creation would have been Thursday, i.e., feria 5. This is the first solar regular; and the other regulars, which express the relationship of 1 March with the first day of all the other months, can be calculated from it.

p.215, 1-2 Expugnans alios casus facit aspera dives.

Gaudet blandus egens, gaudia cessa ferens]

A mnemonic, like the two simple lines preceding, to establish the solar regulars. The initial letter of each word represents the number of the regular, beginning from March.

p.216, 1-2 altitonans dominus divina gerens bonus exstat

Gratuito celi fert aurea dona fidelis]

A mnemonic to find the Dominical Letter. It should perhaps be viewed as mental gymnastics; if you had the other information, you would scarcely need this. Each of the twelve words represents a month, beginning with 1 January. The method is best illustrated by an example: in 1990 1 February was on Thursday. Count down through the days of the week, i.e., Thursday, Friday, Saturday, Sunday. The number that "serves" February is 4 (=D); number the days, i.e., 4,5,6,7. The Dominical Letter is again shown to be G (= 7).

This mnemonic is to be found in the Massa compoti, followed

by a shorter one which conveys the same information.⁷⁰ Cordoliani recorded the first of these in an eleventh century MS.⁷¹ According to Faith Wallis, it is to be found in MS St John's 17.⁷²

pp.217-9 THE BISSEXTILE.

Duodecimal fractions are used in the calculation of the bissextile. The writer has told us that the Julian Year consists of 365 days and 6 hours, and here this length of time is related to the sun's journey through the signs of the zodiac. According to Julius Caesar and other wise men, the journey through each sign takes 30 days, 30 trientes hore, 30 bisse momenti (it is helpful to the modern reader that the bisse momenti was equivalent to one minute, although this is to transfer our calculations to a different system entirely). Days, hours and moments are then separately multiplied by 12, and the products added to produce 365 days 6 hours.

This is the traditional calculation, which the compotist has already warned us is an over-estimation.⁷³ Jones tells

⁷⁰Massa compoti p.55.

⁷¹Alfred Cordoliani, "Contribution à la littérature du comput ecclésiastique", 183.

⁷²Faith Wallis, MS Oxford St John's 17 p.313.

⁷³See p.201, 3-4.

us that "the bissextus was a popular topic in computi,"⁷⁴ and calculations of this kind, common enough in Insular sources, are popular with later compotists. Similar material is to be found in Helperic,⁷⁵ and in Gerland,⁷⁶ although neither make use of Roman fractions. Bede himself ridiculed efforts of this kind:

Sunt enim nonnulli qui facilitate computandi absque labore comprehendent quarta bissexto crescentis particula pars singulos annos vel menses vel etiam septimanas et dies incessanter adimpleatur⁷⁷

His observations are pertinent: since the calculation has presumably in the first place been worked backwards from the Julian Year, it adds nothing to our knowledge of the bissextile. Moreover, the process is long-winded in the extreme. The parallel passage in the De temporum ratione is Chapter XXXVIII. In particular, Bede's statement that omitting the leap-day would result in the seasons being transposed is repeated by most compotists.⁷⁸ It is an event which seems to be viewed with peculiar horror, perhaps

⁷⁴C.W.Jones, Beda Opera de temporibus p.371.

⁷⁵Liber de computo, PL 137 21D-22D.

⁷⁶Digby 56 fol 171r.

⁷⁷DTR p.251.

⁷⁸Thus Roger of Hereford, Digby 40 fol 27r: quem si pretermiserimus tabula que dicitur kalendarium, a solis progressu discordaret infra .xci. bissextiles annos totidem diebus, et esset solstitium ubi estimaretur equinoctium, et econtra.

because something like this happens with the Muslim calendar, which is purely lunar.

p.219, 10-11 Bisextum sexte Martis tenuere kalende,
Posteriori die celebrantur festa Mathie]

The same mnemonic occurs in the Massa compoti and the Compotus of Conrad of Strasbourg.⁷⁹

p.219, 13 senarius est primus numerus perfectus] The bissextile was intercalated in February, so that in a leap-year vi.kal.Mar. occurred twice. The reason it is placed there, the compotist tells us, is because 6 is the first perfect number, and 28 the next, and February generally has this number of days. The perfect number, which is the sum of its aliquot parts, continues to fascinate mathematicians.⁸⁰

p.220, 5-11 Utrum autem sit annus bisextilis nec ne....]
This familiar argumentum appears in Helperic and Bede,⁸¹ and derives from Dionysius.⁸²

⁷⁹Massa compoti p.58; Bruges 528 fol 1rv.

⁸⁰See K.P.Moesgaard, "Tychoonian observations", Journal for the History of Astronomy 6 (1975), 84; for a modern treatment: K.H.Rosen, Elementary Number theory and its Applications, (New Jersey 1988), pp.199-203 (I am grateful to Dr Brendan Goldsmith, Dublin Institute of Technology, for this reference).

⁸¹Liber de computo PL 137 38D-39A; DTR p.274.

⁸²Dionysius Exiguus, Argumenta Paschalia PL 67, 502A.

Having dealt with the concurrent and the bissextile, the writer turns to the solar cycle, which is the 28-year cycle that takes account of them. He notes (mistakenly) that the Dionysian cycle, that approved by the Church, begins in the 12th year of that proposed by Gerland. He associates himself with the latter, but the rest of the section, which gives practical methods for finding the dominical letter, the concurrent, the bissextile, and the year of the cycle, refers only to the Dionysian cycle.

The statement that Gerland's cycle predates that used by the Church by 12 years is directly quoted by John of Sacrobosco in the De anni ratione.⁸³ Grosseteste has the same figure, although he does not attribute it to Gerland.⁸⁴ What is the source of the 12 years? As Steele points out, Gerland's final conclusion was that there was an error of 7 years in the Era as calculated by Dionysius:

In quo perspici potuit tabula dionisii, initium cuius
secunda est linea nostre non incepisse .dxxx^oii^o. anno
an incarnatione domini ut ipse voluit, set incipiente
d^{mo}xxv^o.⁸⁵

⁸³p.462.

⁸⁴Computus correctorius p.231.

⁸⁵Digby 56 fol.178r.

According to the Dionysian reckoning, Good Friday was on 25 March. Good Friday was the day after the Passover, which was celebrated on the day of the full moon (Luna XIV), so that it must have been Luna XV. Gerland disputes this date, basing his calculations on the Acta synodi of ps-Theophilus, which placed Good Friday on 23 March. He constructs new tables which show that Dionysius has placed the Incarnation 7 years too late.⁸⁶

Cordoliani pointed out that Heriger de Lobbes, not Gerland, was the originator of this emendation, but the latter seems to be the channel through which it reached England.⁸⁷

The reference in the Computus ecclesiasticus has nothing to do with this calculation. But earlier in his treatise, Gerland has shown that even on the basis of his own dating, Dionysius was wrong, and had placed the Incarnation 20-21 years too late. He points out that on the basis of the Dionysian reckoning, Christ must have died either earlier than the 13th or later than the 250th year of Dionysius's 532-year cycle, since it is only in year 13 of the 19-year Cycle that the necessary conditions - i.e., that Good Friday falls on 25 March, Luna XV - are fulfilled.

⁸⁶Digby 56 fol 178r: in quo perspici potuit tabula dionisii initium cuius secunda est linea nostra non incepisse .dxxxii. anno ab incarnatione Domini ut ipse voluit set incipiente .dxxv.

⁸⁷See A.Cordoliani, "Abbon de Fleury, Hériger de Lobbes, et Gerland de Besançon sur l'Ere de l'Incarnation de Denys le Petit", Revue d'Histoire Ecclésiastique 44 (1949), 469-472.

Dionysius placed the Incarnation in the second year of his cycle, and so year 13 of the 19-year Cycle occurs 12 or 259 years later:

Nonne hoc plane datur intelligi quod si ut dionisius voluit secundo anno sui circuli dominus incarnatus fuerit epactis .xi. existentibus et .viii^{us}. kal. aprilis passus, necesse fuit eum citra tresdecim annos vixisse vel ultra .ccl., quandoquidem .xiii^{us}. circuli annus .xix^{lis}. habens .v. concurrentes, aut .xii^{us}. est a secundo eiusdem tabule dionisii aut .cc^{us}lix^{us}. proxime post illum.⁸⁸

He appends Dionysius's 532-year table so that the reader can more easily see this for himself.⁸⁹

This passage would appear to be the source of the 12 years. The difficulty is that the event that is being referred to is not the Incarnation but the Crucifixion, which happened a little more than 33 years after Christ's birth.⁹⁰ If Dionysius shows the Crucifixion as happening in the 13th year of his cycle, the actual Incarnation must predate his

⁸⁸Digby 56 fol. 177r. This passage is printed by Cordoliani, "Abbon de Fleury", 486.

⁸⁹Digby 56 fol.177r: Quod ut facilius lector agnoscat, non pigeat nos ipsam tabulam dionisii subiungere. The table itself appear on fol.177v.

⁹⁰Digby 56 fol.176r: habet ni fallor ecclesie fides dominum in carne paulo plusquam .xxxiiium. annum vixisse usque ad sue tempora passionis.

by 20 years. And this is Abbo's emendation, which was taken up by Marianus and which came to England via Robert of Hereford.⁹¹

Steele observed that both Sacrobosco and Grosseteste were mistaken about Gerland.⁹² Of course, the source of the mistake was the Compotus ecclesiasticus. It is further evidence of Grosseteste's use of the treatise: it is not a mistake that he would have made if he had studied Gerland at first hand.

p.222,17 ubi unitas est concurrens] The Dionysian cycle starts with concurrent 1, Dominical letter F, in a bissextile year (the bissextile day has actually occurred before the beginning of the year, since the cycle of concurrents begins on 24 March). The other bissextile years follow at four-yearly intervals.

p.223,6-9 FalliturB Eva dolo, cibet, adeB gaudia finit
Et cumB botrus adhuc germinet EvaB dolet
Christus bella geritB finitur eo duce bellumB
Ad gravida fit duxB cuncta beavit ave]

B marks the place where, because of the bissextile, the concurrent leap-frogs over one number. The mnemonic can be used in three ways:

⁹¹Cordoliani, "Abbon de Fleury" 467-469.

⁹²R.R.Steele, Opera hactenus inedita fratris Rogeri 6, p.xxi.

1.To find the Dominical letter. As has been said, the Dominical letter was Roman in origin, and therefore, unlike the cycle of concurrents, begins in January; the Dominical letter as it appears in the mnemonic (F,E, etc) applies only from March-December in the bissextile year; January and February being "served" by the preceding letter.

2.To find the concurrent. A number from 1-7 is assigned to the Dominical letters.

3.To see if a year is bissextile. Where an initial letter in the mnemonic has been leap-frogged, the next year is bissextile. This can also be established by means of the compotus manualis. The 28 years of the cycle are counted round on the joints and tips of 7 fingers, the leap-years being those which land on the tips (the thumb won't do for this technique, because it has only 2 joints - but that makes it invaluable for the 19-year Cycle).

The mnemonic applies to the Dionysian Cycle. The Massa compoti and the Compotus of Conrad of Strasbourg have variants which work in the same way.⁹³

An alternative mnemonic occurs in the De anni ratione of

⁹³Massa compoti p.57:

Fons educit agrum frons escas bos agit edum
Cumbit gens fons est dabit agrum fronde cibos ars;

Bruges 528 fol 2v:

Fors edit cor agit fors excubat
angit edaces biga edebant
alga fides cibus ars.

John of Sacrobosco. This he says is secundum veritatem et utilitatem considerationem:

Fons est dans bisB agro fundusB cibat auferB edacem
AuBgens fert escasB bos aut gens eBdacibus glansB⁹⁴

Here it is the initial letter of each syllable which is counted, but the principle is the same. The mnemonic which applies to the Dionysian cycle is mentioned as an afterthought. The latter mnemonic is secundum Gerlandum: it takes into account that the first year of the solar cycle, strictly speaking, has no concurrent, so that the cycle of concurrents should start in the second year of the solar cycle.⁹⁵

p.225, 5 Fallit amor cautos extant grave basia dantes]

This mnemonic represents the seven bissextile years in the cycle of concurrents. The initial letters of the words refer back to the words beginning with the same initials in the mnemonic establishing the Dionysian Cycle.

15 Nam solis decimo Christus nato fuit annus]

Add 9 to the Year of Our Lord, and divide by 28; any remainder shows the year of the cycle.

pp.226-7 THE SEASONS.

⁹⁴De anni ratione, p.461.

⁹⁵See above, p.297.

The year is divided into four seasons, spring, summer, autumn and winter. A mnemonic to find the beginning of each season is given: it is not entirely accurate, but the writer says this is unimportant.

The passage is based on Chapter xxxv of the De temporum ratione. Gerland has a similar passage, citing Bede,⁹⁶ but in the present text references to man as a microcosm and a detailed discussion of the four complexions have been pruned. The Computus ecclesiasticus follows Bede in the number of days that are assigned to the different seasons, but the mnemonic reproduces the dates which are to be found in the De natura rerum of Isidore.⁹⁷ This accounts for the computist's apparent puzzlement about when the seasons begin.

p.226, 12-15 Festum Clementis capud est hiemis orientis...] The mnemonic appears in the Massa compoti, but with the lines differently ordered; in the Computus of Conrad of Strasbourg, they follow the present order.⁹⁸

pp.227-231 The solstices and equinoxes [See next section, The Emendation of the Julian Year pp.313ff.

pp.231-4 FASTS.

⁹⁶Digby 56 fol 175rv.

⁹⁷See C.W.Jones, Bedae opera de temporibus p.369.

⁹⁸Massa compoti p.58; Bruges 528 fol 1v.

In each of the four seasons there is a fast of four days: their purpose is both moral and medical.⁹⁹ Certain Saints' Vigils are kept as fasts. The student is referred to the Summa de ecclesiasticis officiis of John Beleth if he wishes to know why the other vigils are not fasts.¹⁰⁰ Advent is an oddity in the ecclesiastical year: it does not have a fixed place in the calendar, but is connected with Christmas, which does. It is logical therefore for the writer to explain how to find it here, at the end of the section dealing with the solar year.

p.232, 7-8 Dat crux lucia cineres carismata dia,
Ut sit in angaria quarta sequens feria]

Cf. Massa compoti p.58.

p.234, 1-3 Andree festo vicinior ordine quovis
Adventum Domini prima colit feria,
Si cadet in lucem domini celebratur ibidem]

Advent is always celebrated on the nearest Sunday to St Andrew's Day (30 Nov.). If 30 Nov. is a Sunday, then this is the First Sunday in Advent.

The inclusion of material about fasting appears to have

⁹⁹In the spring the blood needs regulating: this no doubt is the reason why children of my generation were still threatened with "brimstone and treacle" at this time of the year!

¹⁰⁰Two MSS, Ashmole 1285 fol 112rb, and Univ 26 fol 57r, which shares the same tradition, give a fuller account of what John Beleth says.

been a fairly recent innovation in Compoti. The material about the complexions of the seasons is to be found in Chapter XXXV of the De temporum ratione. The passage which is quoted from the De ecclesiasticis officiis of John Beleth is part of a longer section on fasting,¹⁰¹ but a closer parallel seems to be in the Sacramentarium of Honorius.¹⁰² The Compotus of Conrad of Strasbourg contains material on the ieiunia .iiii^{or}. temporum, but not, it would seem, from the same source.¹⁰³

¹⁰¹Johannis Beleth, Summa de ecclesiasticis officiis ed. H. Douteil (C.C.cont.med. XLIA, Turnhout 1976), p.251.

¹⁰²Honorius Augustodunensis, Sacramentarium PL 172 758: De jejuniis quatuor temporum.

¹⁰³Bruges 528 fol lv.

II: The Emendation of the Julian Year.

pp.227-231 THE SOLSTICES AND EQUINOXES.

The writer tells us that there is some doubt about the dates of the solstices and equinoxes. Some MSS say "some doubt amongst the moderni": who the moderni were will be discussed later. According to the compotists, the sun enters a new sign of the zodiac on the XV kalends of the month, and the solstices and equinoxes should occur eight days later, i.e., on the VIII kalends. This means that the winter and summer solstices should occur on Christmas Day and St John the Baptist's Day respectively, and the spring and autumn equinoxes on the Annunciation and the Conception of St John. These dates are supported by the Scriptural text (unaccountably here attributed to Matthew): "He must increase but I must decrease" (John, 3, 30); and by the Gloss, which interprets this to refer to the lengthening and shortening of the days which occur after these points in the year.

This, the compotist says, may have been true "then". In the context, he appears to mean at the time of the Incarnation. "In our time" it is no longer true. The equinoxes and solstices have slipped backwards because we have allowed more time for the sun's course than ought to have been allowed. He has told us earlier¹ that "Julius Caesar and

¹p.217.

other wise men" calculated that the sun took 30 days, 30 trientes hore and 30 bisse momenti to travel through one sign of the zodiac. The actual time contains not 30 bisse momenti, but 29: and thus there is an overestimation in each sign of $2/3$ moment. Since the sun travels through twelve zodiacal signs in the course of the year, in one year this will amount to 8 moments, which is $1/5$ hour. In 5 years the overestimation will be one hour, and in 120 (5×24) years a whole day. 1200 years, the computist tells us, or rather more, have elapsed since the Incarnation: and so there has been a 10-day backward shift in the solstices and the equinoxes.

This passage is of particular importance, because it presents a solution to a problem which had puzzled computists since before the time of Bede. Computus ecclesiasticus is one of the first treatises to embody such an attempt, one which as we shall see is surprisingly accurate. It is particularly interesting that it appears in a work which seems to have been intended for the use not of advanced scholars, but of elementary arts students.

The problem was perceived in the first place as one of the discrepancy between the Roman and the Alexandrian placing of the equinoxes and solstices, and it is in these terms that Pièrre d'Ailly addressed the Council of Constance in 1417:

Et tamen, sicut Beda narrat, quidam Aequinoctia VII kal. Aprilium, et VII kal. Octobr. Solstitia VIII kal. Julior. et VIII kal. Januar, quidam XII kal earundem notandum esse sanxerunt.²

It eventually became clear that the discrepancy was due to the fact that the Julian Calendar over-estimated the length of the tropical year: this caused the solstices and equinoxes to shift backwards from observed dates in the Ecclesiastical year.

I propose here, having summarised what the writer of the Compotus ecclesiasticus has to say on the subject, to discuss how accurate these ideas are, and to trace as far as possible how they developed.

The astronomical measurements used by the compotists were approximate, and in any case not constant, unlike those of modern chronometry.³ Thus, in 45 BC, when the Julian calendar was introduced, the tropical year was approximately 365.2423 days; in 1900, it was approximately 365.2422 days. The Gregorian reform emended the Julian calendar by omitting three leap-years in every 400. A more

²Pierre d'Ailly, Exhortatio ad Concilium Generale Constantiense super correctione Calendarii ed. J.D.Mansi, Sacrorum Concilium Nova Tom.xxviii, (Venice 1785), cols.373-374.

³See K.P.Moesgaard, "Basic units in chronology and chronometry" in Gregorian Reform of the Calendar, ed. G.V.Coyne, M.A.Hoskin, O.Pedersen (Pontificia Academia Scientiarum 1983), p.4.

accurate measurement would result from the omission of one leap-day in every 128 years.⁴ The proposed emendation in the Compotus ecclesiasticus is thus surprisingly accurate: Grosseteste suggested omitting one day in 100 years: Sacrobosco, as we have seen, one day in 288.

How did the writer of the Compotus ecclesiasticus come by his rather accurate estimate? Ferdinand Kaltenbrunner suggested that it could have been deduced from Bede's account of the equinoxes and solstices in Chapter XXX of the De temporum ratione. He was working with access to an extremely limited number of texts, but the suggestion is interesting, and deserves examination. It is possible now, however, to trace the development of ideas about the problem after Bede's time, and to show, perhaps, why no solution to it appeared before the end of the twelfth century.

To consider Kaltenbrunner's argument first. As has been said, there was a discrepancy between the old Roman reckoning, which set the spring equinox on 25 March (VIII kal. Apr.⁵), and the Alexandrian reckoning, which was accepted by the Council of Nicaea, and which set it on 21

⁴ See J.G. Whitrow, Time in History (Oxford 1988), p.187.

⁵I propose to use the Roman form of these dates throughout this discussion; it is one of the peculiarities of this system that VIII kal. Jan. and Mar. fall on the 25th of those months; VIII kal. Jul. and Oct. on the 24th; and so on.

March (XII kal. Apr.). In his early treatise on the calendar, De temporibus, written in 703, Bede placed the solstices and equinoxes, according to the Roman reckoning, on VIII kal. of their respective months.⁶ In the De temporum ratione, written in 725 at the request of his students to expand what he had written in De natura rerum and De temporibus, especially about time,⁷ he revised these dates. The earlier dates (XII kal), he now tells us, have the backing of "paternal authority and horological consideration".⁸ The second part of this statement should not be taken to refer to first-hand astronomical knowledge. As Jones observes, "It would surprise us if a study of shadows had proved to the monks of Wearmouth that the equinox, which by that time had moved forward to March 17th, was on March 21!".⁹ Yet the reference to practical observation is interesting in light of later developments.

Bede identifies the two sets of dates as respectively pagan Roman and Alexandrian, but does not attempt to reconcile the two. They were, of course, dates that had originally been arrived at by observation, and the discrepancy between the two is due to the length of time that had elapsed

⁶De temporibus liber, ed C.W.Jones, Bedae opera de temporibus p.297: Solstitia et aequinoctia bina putantur viii kal. januarii et julii aprilisque et octobris.

⁷DTR p.175.

⁸DTR p.237: sicut non solum auctoritate paterna sed et horologica consideratione docemur.

⁹ C.W.Jones, Bedae opera de temporibus p.127

between the two observations.

According to Kaltenbrunner, it was the difference between the two sets of dates which led to the deduction that the duration of the year was shorter than had previously been thought, and pointed the way to the rectification of the error:

Man bestimmte annähernd den Tag, auf welchen das Aequinoctium fiel, und dividirte durch die Anzahl der Tage, um welche es vor den 25 März eintrat, die seit Christi Geburt verflossenen Jahre. Der Quotient ergab die Anzahl der Jahre, innerhalb welcher die Jahrpunkte um einen Tag in Kalender zurückkrüchen.¹⁰

One might well respond to Kaltenbrunner that the medieval mind was not programmed to make deductions of this kind; but it is at least interesting that such a deduction, as he points out, would have been worked backwards. In the Compotus ecclesiasticus, the calculations for both the bissextile and the saltus lune are worked in this way. The calculation for the overestimation of the length of the solar year is presented by the writer of the Compotus ecclesiasticus in a similar form, and fits very comfortably into the mould: there is a presumably intentional verbal reference to the bissextile calculation: sol moratur in

¹⁰Ferdinand Kaltenbrunner, Die Vorgeschichte der Gregorianischen Kalenderreform (Vienna 1876), p.293.

quolibet signo; and to that for the saltus lune: plus temporis quam deberet attribui.

Kaltenbrunner's explanation begs the question why, if the deduction was possible from Bede's text, it does not appear before the end of the twelfth century. The answer, I would argue, is that it had to wait for two developments: firstly the renewed possibility of working from astronomical measurements, rather than from auctores; secondly the reception of new mathematical ideas from Arab Spain, which acted as a catalyst in the search for a solution.

To begin with, in any case, when the ideas which were embodied in the De temporum ratione began to be criticised, attention was focussed elsewhere, on the dating of the Christian Era.¹¹ But the problem of the two sets of dates did not go away. Earlier computistical codices, Jones tells us, "were filled with short tracts on solstices and equinoxes" which detailed both sets of dates without attempting to reconcile them.¹² Material of this kind was incorporated into many post-Bedan treatises, but in some of them the discrepancy now began to attract comment.

Particularly interesting in this respect is the comment of the late ninth century writer Helperic:¹³

¹¹See above, p.304ff.

¹²Beda's opera de temporibus p.365.

¹³for Helperic, see above, pp.54-5.

De ipso autem aequinoctio varia non tantum veterum, verum etiam modernorum exstat opinio, aliis xii kal. April., aliis vii[i] kal. asserentibus.¹⁴

This passage represents a development from Bede. Joachim Wiesenbach has drawn attention to the "remarkable chapter" (XXX) which follows it.¹⁵ In it, Helperic explains how the sun's rays can be measured, and used to verify the position of the solstices and equinoxes:

Primum itaque coenaculum aliquod orienti oppositum deligatur, et in eo foramen tale notatur per quod singulis suis exortibus, qui sunt clxxxii [i.e., from solstice to solstice], sol radios suos introjacere possit. Tum singulis exortibus notentur loca quae radius ille lustrat in occidentali pariete praefati coenaculi.¹⁶

Since, like Bede, he still identifies the solstices and equinoxes with the XII kal. of their respective months, we must assume either that he has not himself performed the operation he describes, or that he prefers to ignore the evidence in deference to authority. The latter is not impossible, if a statement from the Compotus of

¹⁴Helperici Liber de computo, PL 137 40D.

¹⁵Joachim Wiesenbach, Sigebert von Gembloux Liber decennalis (MGH Quellen zur Geistesgeschichte des Mittelalters 12, 1986), p.56.

¹⁶Helpericus, Liber de computo, PL 137, 40D-41A.

Constabularius can be taken as evidence of the sort of assumptions that might be made:

Ex hoc ergo videtur quo unusquisque supradictorum auctorum vel ibi dixit esse solstitia et equinoctia ubi ea in tempore suo reperit, vel in antiquorum confisus ingenia eorum auctoritatibus adquevit.¹⁷

In any case, it is the reference to practical measurement that is interesting, predating, as it does Gerbert of Aurillac (c.945-1005) and his treatise on the Astrolabe. The scientific and mathematical achievements of the Lotharingians sprang from fertile ground.

Helperic has told us that there are different opinions about the dates of the equinoxes and solstices amongst veteres and moderni. This antithetical concept (more often found in the form antiqui - moderni) will appear with increasing frequency from the ninth to the twelfth centuries.¹⁸ As has been mentioned above, some MSS of the Computus ecclesiasticus refer to doubt about these dates apud modernos. It seems worthwhile, therefore, to ask what the term means in the context of computus, and, indeed, possibly to rid it of some of the associations that it has attracted in both medieval and recent writers.

¹⁷BL MS Cot.Vit.A XII fol 95va.

¹⁸Elisabeth Gossman, "Antiqui und Moderni im 12. Jahrhundert", Miscellanea Medievalia 9 (1974), 41.

All the self-confidence of the twelfth-century Schools seems to be contained in John of Salisbury's famous statement:

Nec dedignatus sum modernorum proferre sententias,
quos antiquis in plerisque preferre non dubito.¹⁹

John of Salisbury tells us that he pursued quadrivial subjects, but as has been said above, they have left little trace on his writings. The glory of the Paris Schools was logic, and this is the context of John's comment. The antiqui - moderni antithesis had many applications,²⁰ and the optimism of John's statement implies a changing attitude to innovation which was not confined to the intellectual sphere. In the next century, Robert Grosseteste was to argue the case against custom for custom's sake at the 1250 Council of Lyons.²¹

A recent commentator has suggested that there was in the twelfth century a school of writers who called themselves the moderni, and who were conscious that they were part of

¹⁹John of Salisbury, Metalogicon, ed. J.B.Hall, auxiliata K.S.B. Keats-Rohan (CC cont.med. 98, Turnhout 1991), 11.

²⁰Elisabeth Gossman, "Antiqui und Moderni im 12. Jahrhundert", 43.

²¹The question concerned his right to visit the Dean and Chapter of Lincoln; see Beryl Smalley, "Ecclesiastical attitudes to novelty c.1100-1250", in Church, Society and Politics (Ecclesiastical History Society, Oxford 1975), 114.

a scientific revolution.²² Like John of Salisbury's statement which was quoted above, this implies approval for innovation. In contrast, references to moderni in computistical writers from Helperic to the Computus ecclesiasticus appear to use the term in a way which sometimes implies approval, but as often neutrality or even disapproval. The references certainly cover too wide a time-span to imply a "school" of any kind. What is more significant is that from Helperic onwards, the term appears in the context not only of theoretical calculation but also of practical observation. It was the increasing possibility of accurate measurement, as I have suggested above, which was an essential prerequisite for the correction of the calendar.

Helperic's reference to moderni is in the context of the dating of the solstices and equinoxes. It was a problem which was particularly amenable to measurement, since the text from John 3 which associated these points in the tropical year with Scriptural events provided a starting point for dealing with it:

Set licet tunc hoc fuerit verum, in nostro tempore non est ita.

Helperic is not cited by name in the Liber decennalis,

²²Tina Stiefl, The Intellectual Revolution in the Twelfth Century (London and Sidney 1985).

which, as its recent editor has shown, may be attributed to Sigebert of Gembloux (c.1030-1112);²³ but the association of ideas - dating, moderni and practical measurement - is even more evident in this work:

Antiqui equinoctia et solsticia in .viii°. kal posuerunt, iuniores utpote perspicatiores in .xii°. kal. ea transposuerunt, moderni adhuc multo perspicatiores ex umbrarum motu ascensum vel descensum solis in solsticio oculis et manibus notantes, tropica solis in Cancro et Capricorno rectius in .xv°. kal. assignanda credunt.²⁴

In this passage, three sets of dates are associated with three groups of people: the antiqui, who placed the equinoxes and solstices on the VIII kal., the iuniores, who placed them on the XII kal., and the moderni, who transposed them to the XV kal. The description of the iuniores as perspicatiores is, as Wiesenbach points out, taken from Priscian, and with this group Sigebert associates Bede, who supported the second set of dates:

Dominus Beda, vir multe lectionis ac per hoc inter

²³See Joachim Wiesenbach, "Der Liber decennalis in der Hs. Rom, Biblioteca Angelica 1413, als Werk Sigeberts von Gembloux", Deutsches Archiv für Erforschung des Mittelalters 33 (1977), 171-181.

²⁴Sigebert of Gembloux, Liber decennalis, ed. Joachim Wiesenbach (MGH Quellen zur Geistesgeschichte des Mittelalters 12, Weimar 1986), p.253.

scriptores multe auctoritatis, potest solus in hoc sufficere nobis, qui quanto iunior tanto fuit perspicatior et quasi apes ex multorum auctorum floribus dulcoravit fanum sue lectionis.²⁵

Helperic's moderni have become Sigebert's iuniores. His moderni appear once more to have corrected the dates by observation (oculis et manibus notantes); but the past tense of transposuerunt is significant: by Sigebert's time the equinoxes and solstices had moved back yet further to the Ides of March.²⁶

What was Sigebert's attitude to the moderni? In the above passage, it appears to be positive enough. Sigebert's main concern in the Liber decennalis was with the correction of the Dionysian cycle,²⁷ and in this context his moderni are calculators rather than observers. A reference to Marianus Scotus elicits similar approval:

Modernior omnium cronographorum Marianus Scotus, vir laudabilis vite et scientie, scribens et ipse contra errores Dyonisii et perpendens non posse Dionisium concordare ewangelio in anno dominice passionis²⁸

²⁵Liber decennalis p.194.

²⁶Liber decennalis p.157.

²⁷Liber decennalis p.32.

²⁸Liber decennalis pp.258-9.

There is an earlier reference to Adelbold of Utrecht (1010-1026), who produced a set of Easter-tables which appear not to have survived. It is again in connection with the Dionysian Cycle:

Modernior omnium Adelboldus episcopus
Vultraiectensis²⁹

As Wiesenbach points out, the description shows that for Sigebert, the term moderni had application beyond his immediate contemporaries.³⁰

But although Sigebert's attitude to the moderni appears to be positive, he is not an advocate of change. On the subject of the Dionysian Cycle he warns the supposed pupil to whom his treatise is addressed:

Nam apud omnes pene errorem Dionisii magis commendat
annorum vetustas quam commendari posuit moderni
alicuius quamvis evangelico testimonio comprabata
veritas.³¹

And in the first passage quoted, Sigebert shows no clear support for the moderni. The ultimate truth about this question has not been revealed:

²⁹Liber decennalis p.193.

³⁰Liber decennalis p.152.

³¹Liber decennalis p.284-5.

Rem, quam tanta vexat varietas, plane nondum plene solidavit veritas.³²

Moreover, into the mouth of his "Discipulus" he puts a bravura passage in support of the antiqui:

Sed quod suffecit patribus nostris, sufficiat et nobis, et quod illi dissimulaverunt se nescire, non magnopere cupiamus scire

Whether through policy or conviction, he is content like Sir Thomas Browne to pursue his reason to an "O altitudo!".

Sigebert appears to have no understanding of the true cause for the various dates given for the equinoxes and solstices. He cites Servius, whose view was that the disparity was a matter of place, rather than of time.³³

Reference has already been made to Lotharingian influence in England.³⁴ The Lotharingians brought their interest in computus with them. One of the earliest of these Lotharingian computists was Gerland. On the solstices and equinoxes he cites Bede, and makes no comment of his own on their alternative dating.³⁵ Roger of Hereford, writing a

³²Liber decennalis p.253.

³³Liber decennalis p.253.

³⁴See above, pp.51ff.

³⁵Gerland, Computus, Digby 56 fol 175r.

little over a hundred years later, likewise has little to say on the matter. His treatise is concerned at first with the "vulgar compotus", which converts the fractions of the "compotus naturalis" into whole units - i.e., the Ecclesiastical calendar. His treatment is easy to follow when we appreciate that he is describing the tables tam immobilium quam mobilium festum with which his readers were familiar. Material which is strictly irrelevant to compotus is of interest in that its source appears to have been the De universitatis machina already referred to.³⁶ His main concern in the later, innovatory part of the treatise is with the lunar cycle.³⁷

Roger shows an understanding of the fundamental problem of the calendar, which is the incommensurability of solar and lunar movements:

Set licet ita propter compendium ut sapientes vulgaribus condescendere videantur actum sit, non potest sine dubio horum motuum concordia nisi difficillime et in magno temporis spatio reperiri.³⁸

Interestingly in view of the advanced, not to say daring, nature of Roger's criticism of the Nineteen-year cycle, he has nothing of importance to say on the disparity between

³⁶See above, pp.122ff.

³⁷see below, pp.365-6.

³⁸Digby 40 fol.50r.

the dates of the solstices and equinoxes, which on the evidence of the Liber decennalis, were already a subject of controversy. He is aware of the discrepancy, but comments merely, without giving his evidence for the assertion, that the various dates, including the .xv. kal. parameter which Sigebert had attributed to the moderni, are not the dates of the equinoxes and the solstices, but indicate the entrance of the sun into each zodiacal sign. This is sometimes earlier, sometimes later, because of the variation in the lengths of the months, the sun's motion, and the six extra hours of the Julian year:

Equinoctia vero et solstitia alii dicunt esse in .xii. kal. ian. et iulii solstitia, aprilis et octobris equinoctia, alii .viii. kal. eorum. Set verius patet quod hoc est cum sol signa eorum intraverit. Solem vero signa intrare dicunt alii .xv. kal. mensium. alii .xii. alii .viii. quibus magis videtur sentiendum, non tamen quod semper sic eveniat. Aliquando enim citius aliquando tardius fit, propter inequalitatem mensium, et motus solis, et propter .vi. horas. Non enim sol semper eodem tempore diei principia ingreditur signorum. Nam si in presenti principium arietis ingressus fuerit, primo mane, anno secundo idem intrabit post .vi. horas, id est in meridie, anno .iii^o. in vespere, quarto in nocte media, quinto nisi dies bissexti in .iiii^o. interponeretur una die tardius. Hac igitur ratione cogente quartus semper

bissextum recepit.³⁹

It is a conclusion which presumably had no foundation in any observation of the actual occurrences of the solstices and equinoxes. This is odd when we may assume that Roger would have had by this stage access to an astrolabe, and would appear to have been interested in first-hand observation.⁴⁰

I have suggested that there were two preconditions for the emendation of the Julian calendar. One was access to practical methods of observation, itself aided by imports from the Arab world. The other was the reception of Arabic science. Roger tells us that he has been asked to write on Computus because he is known to have studied astronomy; as indeed, the other works with which he is credited bare witness.⁴¹ Astronomy in twelfth century England meant increasingly the reception of the new science from Spain. The only new authority that Roger cites in his Computus by name is Albumazar. Richard Lemay has argued that the latter's Introductorium in Astronomiam, which was translated by John of Seville in 1133 and by Herman of Carinthia in 1140, was an important channel for the

³⁹Digby 40 fols.26v-27r.

⁴⁰See below, p.336.

⁴¹Digby 40 fol 21r: Hec itaque nonnulli considerentes me quem tam astrologico quam compoto studuisse cognoverunt. For Roger's astronomical and astrological treatise, see Haskins, Studies, pp.125-6.

transmission of Aristotelian natural philosophy to the West,⁴² but is Albumazar's well-known theory on the origin of tides that Roger quotes (and rejects).⁴³ Albumazar is cited in Book IV, which is concerned with the "natural computus"; it is in Book V that Roger shows his expertise in the new Arabic science. These last chapters deal with the movements of sun and moon "according to astronomy".⁴⁴ Roger discusses precession,⁴⁵ using the sexagesimal system, instead of the Roman fractions in which calculations in the earlier books are worked.

Roger's main concern, as has been said, was with the deficiencies of the Nineteen-year Cycle. The Computus of Constabularius, which contains, in one section, an almost overwhelming number of references to the newly available sources, appears to be the first calendar work to draw attention to the overestimation of the tropical year.

The problem is discussed in Chapter xxxvi of the treatise: Quare solstitia et equinoctia non inveniantur in his datis in quibus ea invenerunt antiqui.⁴⁶ The chapter begins with

⁴²Richard Lemay, Abu Ma' Shar and Latin Aristotelianism in the Twelfth Century (Beirut 1962), p. xxxix.

⁴³Digby 40 36v: nobis tamen aliter videtur quod sola vis lune cum aliis superioribus stellis estum istum efficiat.

⁴⁴Digby 40 fol 21v.

⁴⁵Digby 40 fol 46v

⁴⁶See pp. 355-361.

a survey of what the traditional auctores have to say on the subject. Constabularius's material is drawn not only from Bede's De temporum ratione, but also from the Epistula ad VVicthedum.⁴⁷ He quotes from the Acta synodi of ps-Theophilus,⁴⁸ which appears not to have been used by Bede, and also from Helperic and the Liber Iparchi.⁴⁹ John.3,30 is cited, with the relevant gloss. A Jewish authority, Samuel, is cited: he ascended the magisterial chair shortly after the destruction of the Temple. This is one of four references in the treatise to Samuel: later we are told that he lived much later than Ptolemy and Abrachaz and that he is the best of the Jewish masters.⁵⁰

The sources have been thoroughly digested: those who are in favour of the VIII kal parameter are set against those who give XII kal. The specific difficulties in the texts attributed to ps-Theophilus and ps-Anatolius (both texts

⁴⁷C.W.Jones, Bedae opera de temporibus pp.319-325. This letter, Jones tells us (pp 138-9) was usually printed with DTR, and includes material that was not available to Bede when Chapter XXX of the latter work was written.

⁴⁸ De ordinatio feriarum paschaliu, PL 90, 607-610.

⁴⁹ The Liber Iparchi was "copied and conflated" from Martianus Capella: see Haskins, The History of Medieval Science p.89. Hipparchus appears in texts translated from the Arabic as "Abrachiz", and it is in this form that he is cited later in the text.

⁵⁰For Samuel, see above, pp.67-8. I am doubtful about the text here. The Cottonian MSS were of course exposed to fire damage in 1731, and I have studied this text only in photograph, although my son Dr C.E.Moreton has kindly checked my readings against the original.

which were known in the Insular tradition, which maintained the old Roman dating)⁵¹ are discussed. Summing up, the writer tells us that the auctores give either VIII or XII kal; but that any layman who observes the rising and setting sun does not doubt that the summer solstice occurs on XVI kal.

Constabularius has made it clear in the prologue to his work that he is not a slavish follower of the moderni.⁵² No one, he says now, could be so insane as to suppose that the antiqui would fail in what lay simplicity could investigate; and yet without doubt "the authors of our compotus", either deliberately, for computistical convenience, or even, persuaded by perfect consideration that the year was less,⁵³ did not give the true quantity of the year. "So that the subject and cause can be thoroughly investigated, let us see what the geometrical observers have said about this, and discovered by the subtlest reflection".

The facts are set down with precision. In 432 BC, "Mitan" and "Actimon" set the spring equinox on what would have been VIII kal. Apr., "if our calendar had been invented". In 146 BC Abrachis gave the date IX kal; in 140 AD Ptolemy gave XI kal; in 831 AD Thebit gave XVI kal. The dates were

⁵¹C.W.Jones, Bedae opera de temporibus pp.82-3;87-89.

⁵²See above, p.63.

⁵³I am uncertain of the text here.

found accurately (subtilissime) by instrument, and accord with the year as it actually is,⁵⁴ although this last point is irrelevant to compotus. What is important is that the more recent (iunior) the observer the nearer the beginning of March has he found the equinox (in the antithesis quanto....tanto there appears to be a verbal reminiscence of Priscian of the kind that is found in the Liber decennalis⁵⁵): and this is because the return of the sun to the equinoxes takes less time than 365 and a quarter days, so that there is a perpetual retrogression of the equinox.

At last we have the conditions in which the solution of the problem which Kaltenbrunner proposes could be conceptualised; that is, the juxtaposition of measurement and the appropriate theory - both, ultimately, derived from Arab science. And yet the writer appears to be unaware that according to his own thesis, his statement that "any layman" could as a result of observation see that the date of the summer solstice was XVI kal.iul was inaccurate. For he tells us that this is the date that Thebit gave, in 831 AD - it would thus have been fairly accurate for Bede's time, but certainly not for 1175.

In any case, Arab science does not make all things immediately clear. Some of the authorities quoted by

⁵⁴i.e., in which the equinoxes and solstices are reckoned secundum equationem: see below.

⁵⁵See above, p.324.

Abrachis say that the year is longer than $365\frac{1}{4}$ days. Abrachis and Ptolemy says that the length of the year is $365\frac{1}{4}$ days minus $1/300$ day. Thebit says $1/150$ should be subtracted; Albategni nearly $1/106$.

Constabularius explains that Arzarchel and "many other proven astronomers" hold the theory of precession, according to which the solar year is sometimes more, sometimes less than the Julian year. It follows therefore that each of the above auctores either said that the solstices and equinoxes were where they found them to be in their time; or trusting in the skill of the antiqui, they acquiesced with them. There are three ways, he tells us, of reckoning the solstices and equinoxes. According to Abrachaz and Ptolemy, the equinoxes and solstices do not divide the year into four equal quarters: there are $94\frac{1}{2}$ days between spring equinox and summer solstice, $92\frac{1}{2}$ between summer solstice and autumn equinox, 88 days and three hours between the autumn Equinox and winter solstice, and 90 days and "nearly" three hours between winter solstice and spring equinox. These days add up to (nearly) $365\frac{1}{4}$; and this is the same as the hours in the mean solar year, in which the distances between equinoxes and solstices are reckoned as equal. A third way of reckoning is that used by the Compotus artificialis, which reckons in whole days. The last two ways of reckoning pertain to compotus. The "authors of our compotus" have chosen the most convenient length of the year, which is the mean solar

year; in other words, the tropical year, the space of time it takes the sun to return to an equinoctial point. This, according to Ptolemy, should really (proprie) be called the solar year, and it is sometimes longer, sometimes shorter than $365\frac{1}{4}$ days. Thebit and most of the iuniores prefer to refer to the sidereal year, because it is constant in length; and it is this year which is longer than $365\frac{1}{4}$ days.

We have seen the way in which Constabularius used the traditional authorities. He would have been unlikely to have used one text only in dealing with the moderni, assuming that he had access to more (we are reminded of his plea for those who have more books to write on the subject). But at least one verbal parallel suggests that like Bacon after him, one of the moderni that Constabularius knew was a work which has been wrongly attributed to Abraham ibn Ezra. Steele, as has been said, drew attention to the use in Constabularius's treatise of Jewish sources, but he commented on Roger Bacon's use of this text, apparently without noticing that the writer of the present treatise seemed to have known it too.

The work in question is to be found, amongst other places, in MS Digby 40, fols.52-58. This is the MS which has been cited with reference to Roger of Hereford, but this text is in a different, beautifully clear hand. Steele, who missed very little, noted the unusual form of the numerals used in it. This, together with a reference to Cordoba:

et invenimus in libro Ptholomei qui dicitur Algeraphie
de forma terra quod longitudo Cordube est 2 graduum
latitudo vero 36 grada⁵⁶

would imply a Spanish provenance for the work.⁵⁷

Steele accepted that ibn Ezra was the author of the
treatise, which begins:

Dixit Abraham iudeus: Cognitum est corpus solare
magnitudine omnia corpora vincere⁵⁸

but Thorndike has shown that this attribution is
doubtful.⁵⁹ The Digby MS is described by the cataloguer,
Macray, as "Abrahae ben Ezrae, sive forsan Abrahae ben
Chija, de astronomia liber". I shall identify the writer,
for the purposes of this dissertation, as "Abraham" tout
court. The treatise is astronomical, rather than
computistical in content: the sort of material which was
perhaps now becoming required reading for writers on the
calendar. We remember that it was because of his
astronomical expertise that Roger of Hereford was asked to

⁵⁶Digby 40 fol.53v.

⁵⁷Steele was mistaken, however, in calling them "the
true Arabic forms": see LeMay, "The Hispanic origin of our
present numeral forms", Viator 8 (1977), 435-462.

⁵⁸Digby 40 fol.52r.

⁵⁹Lynn Thorndike, "The Latin translations of the
astrological tracts of Abraham Avenezra", Isis 35
(1944), 301.

write on compotus. It deals in detail and with some complexity with all sorts of heavenly movements, but the first section is concerned with the sun, which is the largest of the planets. It is this passage, or one very like it, that Constabularius appears to have seen. Discussing the bissextile, he says:

Christiani qui habitant in terra Saracenorum ponunt bisextum in fine Decembris.⁶⁰

On the same topic, Abraham says:

Qui vero Christiani in terra Saracenorum positi in fine Decembris eo quod finis sit anni ponunt⁶¹

Constabularius tells us the length of the solar year according to Ptolemy and Abrachaz: he could have found this quantity in Abraham's treatise:

Et dicit Abracaz additionem fractionis in anno solari minorem esse quarta parte diei. Et Ptholomeus probavit minorem illam fractionem esse quarta parte tantum quantum valet trecesima pars unius diei⁶²

Again, Abraham gives a similar figure for the length of the

⁶⁰Cot.Vit.XII.A. fol.93va.

⁶¹Digby MS 40 fol.52v.

⁶²Digby 40 fol.52v.

solar year according to Albategni, but in this case links the latter name with other authorities:

Et Albatheni et Aveniunez et beni Sethir et Arzerchel Hispanus plerique horum asserunt id quod deest quarte parte unius diei esse centesimam sextam partem diei⁶³

But the figure given for the overestimation according to Thebit is given as 1/150 day by Constabularius, where Abraham presents a choice of values:

Et Zebit ben Chore composuit duos libros de anno solari, in uno quorum docuit deesse quarte centesimam sextam, in altero superesse quarte centesimam quinquagesimam.⁶⁴

Abraham's treatise becomes increasingly technical, and the writer is aware that the controversies he is describing may cause his readers some difficulty:

Lector vero huius operis pro his discordiis non desoletur que inter sapientes habentur. Non est enim ut opinaris. Discordia enim hec minimi momenti est. Nec impedimenta est operi astronomie.⁶⁵

⁶³Digby 40 fol.53r.

⁶⁴Digby 40 fol.53r.

⁶⁵fol.53v

It is possibly significant that there follows a discussion of precession, which is also discussed by Constabularius; but Abraham's treatment is much more complicated, and refers to many more authorities. But the close verbal parallel quoted above remains intriguing, and we may well conclude that Abraham's treatise is the sort of text to which Constabularius had access. The whole topic deserves much more detailed examination than can be given here.

Constabularius, then, establishes why the solstices and equinoxes are shifting backwards, but he appears not to have had access to first-hand observation. He agrees with Ptolemy that the overestimation of the year is by $1/300$ day:

longitudinem vero anni invenimus iam minorem .iiii^a.
per unam .ccc^{arum}. partium diei.⁶⁶

Yet it would seem that by the end of the century a different solution to the problem had been arrived at, which was so generally acceptable that it found its place in what was to become a standard schools text for at least the next two hundred years. The question remains: what was the source of the figure of one day in 120 years which is contained in the Compotus ecclesiasticus?

A promising line of investigation appears to develop from

⁶⁶fol. 95va

a passage in Abraham's treatise. If Constabularius did see it, he did not make use of a statement which Roger Bacon, whose Computus was finished in 1265, quoted in its entirety:

Sapientes vero Indie secundum dies mundi quos appellant dies descindehind omnes in hoc consentiunt quod annus solaris ultra fractionem quadrantis centesimam vicesimam partem diem continet que est quinta pars unius hore.⁶⁷

Bacon's version differs very little:

Sapientes autem Indorum omnes consenserunt quod annus huiusmodi ultra fractionem quadrantis contineat centesimam vicesimam partem diei.⁶⁸

Here we see the 1/120 value that at first sight might appear to be that in the Computus ecclesiasticus. The problem of course is that both treatises say that the annus solaris, the tropical year (which is what Roger Bacon means by annus huiusmodi), is longer, not shorter than 1/120 day.

The same estimation appears in the last section of the

⁶⁷ Digby 40 fol.52v.

⁶⁸Robert Bacon, Computus, ed. R.R.Steele, Opera hactenus inedita fratris Rogeri 6, 17.

Compotus of Master William (if indeed, the passage is an integral part of the work).⁶⁹ It has the title De iiii^{or} distinctionibus. The writer tells us that there are different opinions about the position of the solstices and equinoxes:

Et hec variatio inde contingit quia solstitia et equinoctia non tenent certum locum in kalendario. Sciendum est quod ut albugoser et arguel testantur annus cursus solis non perficiatur in .ccclxv. diebus et.vi. horis; immo etiam oportet his addi minutias quosdam antequam perficiatur cursus solis, et superhabundat tantum temporis quod in .c. et .xx. annis ex his minutiis superexcrecit spacium unius diei. Unde cum primum erat solsticium hyemale forsitan in primo die ianuarii - unde Ovidius: Principium capiunt Phebus et annus idem - nunc certissime probatur esse die sancte lucie ante natale domini; quando autem incarnatus est dominus fuit idem solsticium in ipso die natalis die sive paululum ante.....Solsticium autem estivale nunc temporis est idus iunii, equinoctium vernale idus martii, equinoctium autumpnale idus septembris.⁷⁰

The writer concludes that as a result of this underestimation of the year the solstices and equinoxes

⁶⁹See above, pp.38-9.

⁷⁰Digby 56 fol.216vb-217ra.

have shifted back, so that the winter solstice which on the evidence of Ovid was "perhaps" originally on 1 January, and later fell at the Nativity "or a little before", is now "most certainly proved" to fall on St Lucy's day (13 December); the dates for the summer solstice and the equinoxes are given at the end of the treatise (Id. Jun; Mar; Sept.).

We have noted that although Constabularius has identified the reason for the shifting solstices and equinoxes, he seems to have had no access to firsthand observation. Master William's dates are more in tune with what would actually have been observed at the time he wrote, and give support to his claim that the date for the winter solstice is certissime probatum. But as with the earlier passages quoted, his data are related to an underestimation of the year, and as has been pointed out earlier,⁷¹ this would result in the solstices and equinoxes moving forwards, not backwards.

The references to "Albugoser" and "Arguel" throw no light on M. William's real sources. The names are so garbled that it is difficult to imagine that the writer knew them at first hand. The Introductorium in astronomiam of Albumazer, which was translated twice into Latin in the space of seven years, was one of first Arab sources to become known in

⁷¹See p.99.

Latin Europe.⁷² It would appear to have been well-known in the west of England, where this codex originated; but it is mainly astrological rather than astronomical in content, and I have not found this author cited in any other discussion of the length of the year.⁷³

The Tables of Azarchel, who was "active in Cordoba between 1029 and 1087",⁷⁴ were also well-known, and tables based on them were produced for the meridians of Pisa, London and Marseilles.⁷⁵ But Azarchel follows Ptolemy in his estimation of the length of the tropical year:

Latini namque tempus ipsum quod continuum est et in sui natura indivisibilem plures intellectum tamen et racione partes dividunt..... annum enim solum illud spacium vocaverunt quo sol recedens ab aliquo zodiaci puncto redit ad idem, quod fit in 365 diebus et quadrante minus .300. unius diei ut a prudentissimo ptholomeo eiusque sequencibus comprobatur.⁷⁶

⁷²See above, p.58-9.

⁷³I examined an early printed edition of John of Seville's translation in Cambridge. It belonged to John Dee, and bears his marginalia.

⁷⁴F.J.Carmody, Arabic Astronomical and Astrological Science in Latin Translation (California 1956), p.157.

⁷⁵Roger Bacon, Computus p.14: secundum annum istum facte sunt tabule quibus utuntur quamplures Latini, et fundate super Anno Domini sicut Tabule Pisane, et Londiniensis, et Marsiliensis.

⁷⁶Camb.Univ.MS Ii.3.3. fol. 117ra. Azarchel's tables have, I believe, been printed, but I have been unable to track down the edition.

One of the authorities whom Constabularius cites is Albategni. His De scientia astrorum, translated by Plato of Tivoli, survives in two English MSS, one of them the Digby MS which includes the Compotus of Roger of Hereford and Abraham's treatise cited above.⁷⁷ Al-Bâttanî, who died in 928, derived the length of his year - 365d.5h.46m.24s.,⁷⁸ or, as Constabularius says, nearly 1/106 year less than the Julian measurement - by comparing his observations with Ptolemy's. "If Ptolemy had not given his equinox one day wrong, the result would have been 1m.58s. larger, nearly right."⁷⁹

Albategni's estimation of the length of the year is possibly as near as we shall get to our 1/120 value in Arab sources. It was accepted by Grosseteste. It is Albategni's calculation, rather than Ptolemy's, that accords with "experience", he says. According to Scripture, our Lord Jesus Christ was born at the winter solstice; the solstice now precedes Christmas Day by about the same number of

⁷⁷F.J.Carmody, Arabic Astronomical and Astrological Science in Latin Translation (California 1956), pp.129-30.

⁷⁸Mahometis Albateni, De scientia stellarum liber cum aliquot additionibus Ioannis Regiomontani ex bibliotheca Vaticana transcriptus (Bononiae MDCXLV) p.66: Erit ergo tempus anni verissimum 365 dierum, et 14 minutorum, et 26 secundarum fere [as in Grosseteste, the minutes are minutes of a day, i.e. 1/60 day = 24 mins].

⁷⁹A.Pannekoek, A History of Astronomy (London 1961), p.167.

centuries which have elapsed since the Nativity.⁸⁰ Thus his solution is based on the same premise, and is not so very different from that proposed by the Computus ecclesiasticus; and it is less radical - and more accurate - than that of John of Sacrobosco, which appears to have been based on the Ptolemaic year.⁸¹

It is presumably not accidental that the 1/120 value seems to occur first around the year 1200. It was possible by then to observe more or less accurately how far the solstices and equinoxes had shifted; the newly-accessible Arabic texts provided a reason for their shifting; and perhaps Albategni, in establishing the length of the year by comparing his observations with those of Ptolemy, showed how it could be done. It must have seemed providential that the calculation could be so easily worked out in round figures, using the well-established methods of calculation.

It has been suggested that the Computus ecclesiasticus is one of the first treatises in which the 1/120 parameter appears. This is not to imply that it originated here. This was a claim that W.E.van Wijk was prepared to make on

⁸⁰Computus correctorius p.215:Et hoc plus consonat ei quod invenimus per experimentum nostri temporis de antecessione solsticii. Quia secundum scripturam, Dominus noster Jesus Christus natus fuit in solsticio hiemali; nunc precedit solsticium Diem Natalem Domini circiter tot dies quot centenarii annorum ab eius nativitate transierunt.

⁸¹Olaf Pedersen, "In quest of Sacrobosco", Journal for the History of Astronomy 16 (1985), 209.

behalf of the Massa compoti of Alexander de Villa Dei.⁸² Alexander explains how the turning-points of the solstices (the metae solstitii) can be found, and provides, in metrical form, the calculation which is to be found in the Compotus ecclesiasticus.

Alexander's explanation concludes with two verses which appear in very similar form in the latter treatise:

Solstitium deno Christum praeit atque Johannem
Et totidem sequitur parinoctia nuntius horum.⁸³

It is possible that the writer of the Compotus ecclesiasticus borrowed them from the Massa compoti, although all the verses that appear in Alexander's work did not originate with him.⁸⁴ It seems unlikely that Alexander was, as van Wijk claims, "le premier des précurseurs de la réforme grégorienne": the preface of his treatise specifically refers to his use of other writers, which is the reason for its title.⁸⁵

Wherever the calculation originated, it was soon to become a computistical commonplace. As has been said, with the introduction of compotus into the quadrivium, there was a

⁸²Massa compoti p.118.

⁸³p.59, 288-289; cf. Compotus ecclesiasticus p.231.

⁸⁴See above, p.127.

⁸⁵ibid.

proliferation of treatises on the calendar. In the Compotus of Conrad of Strasbourg, the relevant passage is as follows:

Contingit autem solstitium hiemale in nativitate Christi, estivale in nativitate Iohannis, iuxta illam theologiam auctoritatem Iohannis dicentes Me oportet minui illum autem crescere ratione solsticiorem. Nunc autem retrocesserunt solstitia fere novem diebus propter errorem compoti nostri. Damus enim anno solari desuper habundanti octo momenta, scilicet quintam partem hore. Unde semper in quinque annis erramus in una hora, in centum et viginti annis uno die. Unde a tempore Christi usque ad hoc tempus fere novem dies excreverunt. Unde etiam si mundus per multa seculi duraturus sit, tandem festa hiemalia fieret estivalia, et econtra, propter eundem errorem. Docetur autem locus solsticiorum hoc versiculo: Solsticium nono preit atque Iohannem.⁸⁶

If the work was written around 1200, as J.D.North assumes,⁸⁷ Conrad would appear to have altered, for his own purposes, both the number of days that the solstices and equinoxes have shifted back, and the mnemonic, which in every other place I have seen it, refers to ten, not nine days.

⁸⁶Bruges MS 528, fol.1v.

⁸⁷See p.36.

A similar passage is to be found in the Computus de arte astronomia of Peter of Berne.⁸⁸ The copyist, it should be noted, has got his arithmetic wrong:

Contingebat autem antiquitus solstitium hiemale in nativitatem christi et estivum in nativitatem sancti iohannis baptiste et tempus numi pompilii acciderat solstitium in kalendas ianuarii. Unde hac ratione voluit quod annus inciperet a ianuario, quia tunc sol incipiebat ascendere. Unde Ovidius: principium capiunt febet et annus idem. Set iam solstitia retrocesserunt X diebus et hoc propter errorem computi nostri quia damus de superabundanti anno solari quartam partem unius hore, et ita in quinque annis unam horam et sic in CXX annis unum diem. Erraminus tempore nativitatis christi usque nunc in X [fol.6r] diebus unde si [verum est tam] diu duraverit festa hyemalia in estate contingerit nisi error iste corrigetur.⁸⁹

The calculation which appears in the Computus ecclesiasticus seems then to have been widely known. It had two merits: firstly, it presented a reasonable solution to the problem of the shifting equinoxes and solstices. Secondly, it could be easily worked out by the traditional

⁸⁸See above, p.37.

⁸⁹Can.Misc.71, fols. 5v-6r. The words in brackets are borrowed from Magister William's Computus, Digby 56, fol.217ra, which Peter appears to be quoting, since the words in the text are unreadable.

methods. I would argue that the usual vehicle in which it was transmitted was the treatise which is the subject of this edition. It is certainly significant that the Compotus ecclesiasticus was still in use as a schools text in the fifteenth century, in company with Sacrobosco's Algorism and Sphere.

The Compotus ecclesiasticus appears to have been the source from which the thirteenth century encyclopedist, Vincent of Beauvais, quoted in the Speculum naturale. Usually meticulous about naming his sources, in dealing with this topic he notes simply ex compoto. Kaltenbrunner suggested that Vincent's source was "a kind of compendium of time-reckoning", and notes that "it deals with the errors of the calendar in exactly the same way as M.Conrad".⁹⁰ We may recognise Vincent's source as the Compotus ecclesiasticus. There is no modern edition of Vincent's encyclopedia, and the text that I have been able to consult is obviously corrupt. Nevertheless, despite the arbitrary amounts in the calculation, the similarities are evident:

Sicut enim testatur Beda, anno in quo natus est Dominus, et Ioannes Baptiste solsticium aestivale fuit in die Ioannis Baptistae [corrupt text?], et octavu gradu Capricorni. Unde me, inquit Iohannes, oportet minui, illum autem crescere. Aequinoctia vero fuerunt in eorum annuntiabus octo gradibus Librae. et Arietis.

⁹⁰Vorgeschichte der Gregorianische Kalenderreform p.307.

Nunc autem decem dies ante praedicat festa sunt solsticia. Et decem dies ante Annunciationes sunt aequinoctia. Quod docetur his versibus.... Cuius causa hec est: Iulius et nos sequentes eum minus damus annus solaris quinta parte unius horae. Nam sol zodiacum circuit in trecentis quinquaginta diebus, et sex horas. Quinta parte unius minus, quae quinta pars in quinque annis unam horam constituit, et in sex annis unum diem. Et in mille et ducentis annis decem dies. Unde cum tot anni transierit ab incarnatione Domini, et etiam plures decem diebus, et quatuor horis et tribus quintis solsticia iam dicta festa precesserunt.⁹¹

It is also noteworthy that the Compotus ecclesiasticus was not spared the fate that awaited all well-used texts of the time, in that it became the quarry of commentators. Thus the version of the text which appears in Cambridge MS Pemb.278 is much extended and in some parts differently ordered. Master Conrad mangles the text more, and mixes it up with the Massa compoti. He is a dire example of what might happen to a text in the hands of a determined but pedestrian commentator, but the text he is mauling is still recognisably the Compotus ecclesiasticus. So he tells us:

Tunc auctor addit dicens: sed a nativitate Domini

⁹¹Vincent of Beauvais, Speculum naturale Liber XV (Venice 1591) 111vb-112rb.

usque huc, scilicet ad tempus meum sunt elapsi mille et ducenti anni.....et ita scilicet in anno domini millesimo ducentesimo dies solsticii yemalis precessit nativitatem Domini per decem dies.

and incidentally dates his own work:

sed modo tempore nostro scilicet anno Domini milesimo trecentesimo nonagesimo sexta supereminet undecim dies et quasi dimidius dies et similiter intelligendum est de equinoctiis.⁹²

Another treatise with the incipit Cum sit intentio emendare falsitatem has sometimes mistakenly been thought to be John of Sacrobosco's emended version of the De anni ratione, because of the ascription at the end:

explicit computus novus phylosophicus compositus per fratrum Johannem de S.⁹³

Kaltenbrunner long ago pointed out that the ascription refers to Brother, not Magister, John de S., and the treatise bears very little resemblance to the De anni ratione. It does, however, cite the Computus ecclesiasticus, and interestingly, relates the length of the year given in the latter text to that of Albategni:

⁹²Vienna 3816 fol.98ra.

⁹³Vienna 5239, fol.28r.

Albategni autem dixit annum solarem habere precise computacione .365. dies et .4.⁹⁴100 unius diei unus, et secundum hoc, si exciperetur in 100 annis unus dies verificatum est kalendarium nostrum. Et hoc magis concordat cum illo quod nos videamus temporibus nostris. In solsticio enim hyemali secundum scripturas Dominus fuit natus quando nunc factus tot diebus precedit nativitatem Domini quot centenarii annorum fierit ab eius nativitate. Moderni tamen compotiste dicunt quod in 120 annis deberet excipi unus. Et hoc magis consonum videtur esse ei quod accidit quia temporibus nostris preit nativitatem Domini 10 diebus et 14 horis et tocies 120 annis fluxerunt ab eius nativitate, quod patet per instrumenta consideratione anno Domini 1271.⁹⁵

Material from the Compotus ecclesiasticus also turns up in commentaries on other writers. A commentary on the Manual Compotus of Anianus which was printed in Paris in 1530 contains the incipit of our present treatise:

Quantum ad primum est sciendum quod compotus est scientia considerans tempora distincta secundum cursum solis et lune, prout ad usam ecclesie dignoscitur

⁹⁴The intrusive 4 seems to be the copyist's error.

⁹⁵Vienna 5239, fol.11r.

pertinere.⁹⁶

and has adapted the old calculation by substituting minutes for moments, and allowing for the continued shift of the equinoxes and solstices:

Verumtamen non potuit facere compotiste quin festum beati iohannis Baptistae celebraretur duodecim diebus post decensum solis quia sol incipit descendere in festo Beato Barnabas [11 June]. Similiter non potuerunt facere quin festum nativitatis domini celebraretur duodecim diebus post ascensum solis quia sol incipit ascendere in festo beati Luciae [13 December] posteriori die. Mirabiliter ergo antiqui compotiste suis in calculationibus mittendo .12. minuta singulis annis hallucinati sunt ut in explanatio sequentis textus patebit.

⁹⁶Compotus manualis Magistri Aniani, cum familiarissimo Iacobi Marsi Delphinatis commentario... (Parrhisiis ...M.D.XXX). The more familiar commentary by Peter Philomena (ed. F.S.Petersen, A Medieval Commentary on Time-Reckoning by Petrus de Dacia (Odense 1979) appears to owe nothing to the Compotus ecclesiasticus.

Quod solstitia et equinoctia .viii^o. kal Ianuarii, Aprilis, Iulii, Octobris sint annotanda multorum late et sapientium seculi et Christianorum sententia claret. Plinius secundus in libro .ii^o. Naturalis Historie sol inquit .iiii^o. differentias habet: bis equata nocte diei, verne et autumpno, in octavis partibus Arietis et Libre; bis permutatis spatiis in auctum diei, bruma, in octave parte Capricorni, noctis vero solstitio totidem in partibus Cancri. Idem sentit Yparcus quem imitatur Martianus. Si ergo sol ingreditur principia horum signorum .xv^o. kal illorum .iiii^o. mensium, conti[n]git has differentias fieri viii^o. kal. Ypocrates archiater scribens Antigono regi testatur vernum equinoctium esse .viii^o. kal Aprilis, solsticium estivum, viii^o. kal. Iulii, equinoctium autumpnale viii^o. kal. Octobris, solsticium hiemale viii^o. kal. Ianuarii. Theophilus in Epistula Sinodica fatetur equinoctium esse vernum .viii^o. kal. Aprilis. Item in evangelio Iohannis: Me oportet minui illum autem crescere. Quod magistri exponentes adiungunt Auctorum lucis eterne cum cremento lucis temporarie concipi simul et nasci decrescere, penitentie vero preconem quem oportet minui cum inchoata minoratione lucis generari pariter et concipi. Dant etiam in equinoctio verno Dominum conceptum et passum, scilicet .viii^o. kal. Aprilis, eundem in solstitio brumali .viii. kal. Ianuarii natum; precursorem vero .viii^o. kal.

Octobris in equinoctio autumpnale conceptum, et in estivo
 solsticio / .viii°. Iulii natum. Secundum Samuelem Iudeum,
 scilicet, omni anno bisextili equinoctium vernale est
 .viii°. kal. Aprilis. in meridie, in tribus annis
 sequentibus vespere, media nocte, mane que sequitur dies.
 vii. kal Aprilis; vel relique .iii^{es}. differentie
 subsecuntur singulem equaliter distantes a precedentibus,
 scilicet .iiii^a. parte anni solaris, que est dies .xci.
 hore .vii. semis. Hic Samuel cathedram magistralem
 ascendit quartus abekina qui fuit presens cito destruyente
 templum. Hic Samuel tandem habebatur in tempore suo ut se
 nosse vias celi melius quam proprie [...] profiteri
 veritus non sit. Ac similiter sanctus Procerius
 Alexandrie episcopus scribens ad papam Leonem inquit: Et
 manifest quid secundum cursum solis .xx.v°. die mensis
 Phamenoth qui est .xii°. equinoctium esse cognoscitur.
 Cirillus eiusdem ecclesie episcopus inquit: finit sol
 cursum totius anni in .xii°. kal Aprilis. Set quis inquam
 est iste finis nisi terminus equinoctii? Bis assentit
 Helpericus, et hoc tam se quam magistros suos simplici
 quodammodo querendi invenisse insinuat. Victor Capuanus
 innuit interdum fieri vernum equinoctium mane vel meridie
 et hoc .xii°. kal interdum vespere vel media nocte, et hoc
 .xi°. Idem asserit Beda in Epistula ad Victeum presbytum.
 Addit etiam argumentum hoc: In Nicena Sinodo constitutum
 est a .ccc^{is}.viii. pontificis ut Pascha celebraretur ab
 .xi°. kal. Aprilis usque ad .vii°. kal Maii. Habet autem
 regula ecclesiastice institutionis ut Pascha celebretur

post transcensum equinoctii. Hoc enim, teste Anatholio, asserit Philo Iudeus. Hoc docet Iosephus et eorum antiquiores Agathobolus et Aristobolus. Necessarie igitur est ut vernalis equinoctium non serius accidat quam in nocte quam sequitur dies .xi°. kal. Aprilis. At tamen Theophilus non ideo voluit Pascha celebrari ab .xi°. kal. ulterius quam .xii°. kal. contingeret equinoctium. Ipse enim fatetur illud esse .viii°. kal; set quia voluit .iii^{es}. dies, scilicet xio, x°, ix° kal. Aprilis exterminari a numero .xxx.v. dierum in quibus Pascha deberet celebrari, ob causam quam ipse postea subiungit dicens: Inpium num est ut passio dominica foras limitem excludatur? Passus namque est dominus ab .xi. kal. Aprilis. qua nocte a Iudeis traditus est, et ab .viii°. kal. Aprilis resurrexit. Quomodo ergo .iii^{es}. dies excluduntur? Omnes episcopi dixerunt nulla ratione fieri debet ut tantum sacramentum foras limitem excludatur. Anatholius inquit: In primo anno initium primi mensis quod est xix annorum circuli principium, secundum Egiptios mensis Phamenoht .xxvi^a. die, secundum Macedones distri mensis .xxii^a, secundum Romanos .xi°. kal Aprilis in qua invenitur sol non solum concendisse, primam partem verum etiam quadram in ea habere. Hec autem particula prima vernale est equinoctium. Quod enim inhabeatur .xi°. kal dicunt quidam, quibus assentit Beda. Alii dicunt inhabeti non .xi° set .viii°; quorum unus ut aiunt fuit Eusebius. Hic itaque scripture variatio uti reor potuit invenire propter iii^{es} bisextiles dies

reliqua. Inposuit forte pia pretitas ne tanti viri auctoritas videretur arguenda [...] Auctores ergo alii viii kal, alii xii^o differentias infixerunt; nec autem quilibet laicus considerans ad foramen aliquo radium solis ascendentem et descendentem non dubitat estivum solsticium potius contingere .circa. xvi. kal Iulii. quam circa .viii^o. kal. vel .xii^o. Neminem tamen arbitror esse tam insani capitis ut opinetur vigilantium antiquorum ignorantie sompnum adeo subrepisse ut fallerentur in ea regule quam proprium indagare potest laicalis simplicitas. Absit. Set procul dubio auctores nostri compoti vel consulte, scilicet commode computationis desiderio, vel etiam quam [...] annum est minus perfecta consideratione inducti veram quantitatem anni solaris non habent. Set ut rem et causam penitus inquiramus, videamus quid geometri speculatores super hoc dixerunt, et subtilissima consideratione invenerint. Anno ante incarnationem Domini .cccc^{mo}.xxx^o.ii. invenerint Mitan et Actimon equinoctium vernale in prima hora noctis qua sequebatur .x.vii^{us}. dies .iiii^{ti}. mensis Egiptiorum, qui dies fuisset .viii^o. kal. Aprilis, si nostrum kalendarium iam esset inventum. Et in anno .c^o.xlvi^o. ante incarnationem fuit vernum equinoctium quod invenit Abrachiz in .iiii^a. hora .xxvii^{mi}. dies .vi^{ti}. mensis Egiptiorum, qui fuisset .ix^o. kal. Aprilis. Et in c^o.xl^o. post incarnationem fuit vernum equinoctium quod invenit Tholomeus. in .viii^o. hora .vii^{mi}. diei. ix^{mi}. mensis Egiptiorum, qui dies fuit .xi^o. kal. Aprilis. Et in anno

95va

.d.ccc^{mo}. xxx.i^o. ab incarnatione fuit vernum equinoctium quod Thebit in libro De anno solis se invenisse commemorat in .viii^a. hora noctis cuius mane fuit .xix^{us}. dies .xi^{mi}. mensis Persarum. Et fuisset .xix^{us}. secundi mensis Egiptiorum, si ipsi non admisissent bisextum. Fuit autem hic dies .xvi^o. kal. Aprilis. Hec quidem equinoctia subtilissime inventa sunt per instrumenta, et respondent equationi. Nam si Tolomeus et Abrachaz non erraverint, in omnibus fuit equinoctium secundum medium casum tardius quo facti duobus diebus et .vi. horis fere. Illa autem equinoctia non ideo ennaravi quia ad compotistas quicquam pertineat equatio. Ipsis enim sufficit medius cursus. Set ut notares predictos spectatores quanto iuniores, tanto vicinius principio Martii invenisse equinoctia. Hoc autem fit quod reversionis solis ad equinoctia fit in minori tempore. quam .ccc.lxv. diebus et .iiii^a. et retrograderetur equinoctium in perpetuum. Si hec anni /[per vitas] perseverat, set antequam perserevabit, vide quid super hec speculatores dixerunt. Inquid Abrachaz: secundum dixerunt Mitan et Actimon est longitudo temporis anni .ccc^o. lxv.dies. et .iiii^a. et una pars et dimidia diei divisi in partes lxx.vi, sed secundum quod dixit Felix. ccc^{ti}.lxv dies et .iiii^a. tantum. Nos autem invenimus lunationes integras contineri xix annis quemadmodum illi. longitudinem vero anni invenimus iam minorum .iiii^a. per unam .ccc^{arum}. partium diei. Ptolemeus quoque invenit sicut Abrachaz. deesse .iiii^{te}. .ccc^{ma}. parte unius diei. Thebit in libro De anno solis monstrat

huiusmodo anno deesse .c^{am}.l^{am}. partem diei. Secundum Albategni deest .c^a.vi^a. fere. Dubitavit etiam Albatheni utrum aliquis motus esset qui ita faceret annum decrescere. Motus autem accessionis et recessionis quem Arzarchel et multi alii probatissimi astronomi approbaverunt, innuit omnes supradictos speculatores verum dixisse in tempore suo. Docet etiam annum solis quandoque crescere quandoque decrescere, quandoque addere super .iiii^{am}, quandoque minuere. Quod si verum est predictum, hic annus erit minor .ccc^{tis}. lxxv diebus; et .iiii^a. retrogradetur equinoctium versus vernalis martii. Cumque addiderit super .iiii^a. redibit addatas in quibus ipsum inveniebatur ab antiquis. Anno igitur ab incarnatione Domini .m^o.ccc^o.xcii^o. erit secundum hunc motum vernalis equinoctium equatum .iii^o. idus martii post meridiem Ierosolime fere .viii. momentis. Oost modum revertitur ad datas sequentes, et progredietur circa ii.d.xx. annos, nec cessabit donec transierit diem .xiii^o. kal. Maii; et tunc denuo reverteretur. Ex hoc ergo videtur quod unus quisque supradictorum auctorum vel ibi dixit esse solsticia et equinoctia ubi ea in tempore suo reperit, vel in antiquorum confisus ingenia eorum auctoritatibus adquevit. Nullusque eorum numero iudicio potest iuste redargui. Accipiuntur etiam solsticia et equinoctia tribus modis ab auctoribus: vel secundum equationem secundum quod dixerit Abrachas et Ptolemeus. A vernali equinoctio usque ad solsticium estivum esse .x^ac.iiii^{or}. dies et semis, hinc usque ad autumnale

equinoctium .x^ac.ii. dies et semis, hinc usque ad solsticium hiemale .lxxxviii. dies. et .iii^{es}. horas, hinc usque ad vernum equinoctium .xc. dies. et .iii^{es}. horas fere. Vel secundum medium cursum, hoc est secundum computum naturalem, secundum quod dixit Samuel has .iiii^{or}. differentias ab invicem equaliter distare, scilicet .xci. diebus. et .vii. semis. horis, hoc est iii^a parte anni. Vel secundum artificialem computum qui non multum dissonare debet a naturali, licet integros dies computet, secundum quod Ypocrates has differentias super .viii^o. kal. iii^{or}. mensium predictorum annotant. Horum ergo trium modorum duo primi ad astronomos pertinent, duo postremi ad computistas. Attende etiam auctores nostri compoti commodissimam quantitatem anni solis elegisse que medium fere locum tenet inter maximum crementum et decrementum; et satis leviter computari potest. At tamen annus solis interdum aliter accipitur quam nos superius posuimus. Vocavimus enim annus spatium temporis qua sol recedens a puncto equinoctii ad idem revertitur, et hic est quem proprie debet dici annum solis approbat Ptolemeus. Hic est quem geometricè inveniunt quandoque maiorem .ccclxv. diebus et .iiii^a. quandoque minorem quandoque tantum. Accipitur etiam annus quandoque pro tempore reversione solis ab aliqua stella ad eandem, et hunc proprie deberet dici annum placuit Thebit et plerisque iunioribus, eo quod hic annus suam semper servat equalitatem ab omnibus enim inventus est maior .ccc.lxv. diebus et quarta.

95vb

III: The Lunar Year.

The solar year previously described determines the position of the immobile feasts; to establish the position of the mobile feasts it is necessary to collate solar and lunar movements by means of the 19-Year Cycle.

The lunar year is described as four-fold, but the first two "years" are the tropical and synodic months. Only the latter, the lunation, is relevant to the Calendar. The 19-Year Cycle equates 235 lunations with 19 solar years. The common lunar year, which consists of 12 lunations of alternating 30- and 29-day periods, is 11 days shorter than the solar year. Seven embolismic years, each containing an extra 30-day lunation, make up the difference. The position of the embolismic years, and difficulties caused by the insertion of the embolism, are dealt with at length. Various strategies for establishing the date of the mobile feasts - the golden number, the epact, and the terms - are described. The saltus lune is explained.

That the workings of the 19-year Cycle were not entirely satisfactory was understood by Bede. He comments that the moon is actually older than it is computed to be.¹ The problems are fourfold:

¹DTR Cap.XLIII: Quare luna aliquoties minor quam computatur pareat.

1. The workings of the Ecclesiastical Calendar, even if it represented an accurate correlation of solar and lunar movements, could only result at best in an approximation to actuality. Computus ecclesiasticus or vulgaris deals only in whole days, while the "natural lunation" was reckoned as $29\frac{1}{2}$ days. The placing of the bissextile, the embolism and the saltus lune interfered with the epact, as Computus ecclesiasticus points out.²

2. The two movements, even if they had been accurately calculated, are incommensurable in practical terms.³

3. The observed position of the moon was affected by the inaccurate calculation of the solar tropical year.⁴

4. The Nineteen-year Cycle depended on an inaccurate calculation of the length of the lunation. The mean synodic month, according to the Julian reckoning, is $(6940 \div 235) = 29.5319$ days. Its actual value is 29.5306 days.⁵

The writer of the Computus ecclesiasticus is aware of the discrepancies in the 19-Year Cycle. After explaining how the embolismic years are inserted, he comments that if they

²p.235-6: Set hoc quandoque impeditur per bisextum, per embolismum, per saltum lune.

³As Roger of Hereford understood: see above, p.328.

⁴See pp.313ff.

⁵See G.J.Whitrow, Time in History, (Oxford 1988), p.189.

were put anywhere else it would make for more mistakes;⁶ and, in some MSS, he makes a promise to deal with the difficulties caused by the saltus lune at another time and place.⁷

The problems of the lunar cycle were described by both Constabularius and Roger of Hereford. Constabularius sets out the position succinctly, although he suggests no rectification. He details three reasons for the moon appearing earlier than its position in the calendar:

1. There is a self-rectifying variation caused by the intercalation of the embolism and the bissextile.⁸

2. The moon appears at different times in different places, so that in the West the new moon appears before it is marked on the calendar.⁹

⁶p.254: Quare autem isti vii embolismi in predictis mensibus et predictis locis intersecantur ratio est quia si alibi ponerentur plures contingerent errores et plures mencierentur epacte.

⁷p.263: Set notandum quod cum hec subtractio ab autoribus sit autentica, tamen habet in se multiplicem questionis scrupulum et falsitatis admixtionem que alias pro loco et tempore verificatur.

⁸Cot.Vit.A.XII fol.95vb: hec est ergo prima causa et principia quare luna nunc uno nunc duobus diebus tardius prima dicatur quam videtur. Plures quoque lunationes .xxix. dierum continuare novus excessus ingerit, immo potius priores emendat.

⁹fol.96ra: Hinc est quod occidentales frequentius aliis gentibus videant lunam antequam prima dicatur.

3. The length of the lunation according to the Ecclesiastical calendar has been over-estimated. This Constabularius shows by comparison with Arabic and Jewish sources.¹⁰

Roger of Hereford proposes a way of rectifying the situation. He points out that the "vulgar", i.e., ecclesiastical, reckoning places the beginning of the lunation three or four days later than it actually occurs, to the amazement of many, he tells us. Some explain this by saying that man was created on the third day of Creation, and thought the moon was new on the day when he first saw it (although the moon was full when it was created). Some, amongst whom we may place Roger himself, find this theory frivolous. Others suggest that the phases of the moon should be counted from the first sight of it, rather than from its conjunction with the sun.¹¹ Roger exclaims in

¹⁰fol.96ra: Nam Arabes quibus assentit alpharganus minorem faciunt lunationem quam nos .c.lx. athomis, Iudei vero .c.xxxix. athomis et .ixa. parte unius athomi. Hiis consentit Arzachel, in cuius tabulis moderni astronomi maxime confidunt. Si ergo nostra lunatio productior est quam oporteret, tardius quoque luna dicetur quam oporteret.

¹¹Digby 40 fol 47v: Naturalis enim accensionem lune quam verissime ex sua qualitate fieri potest initium lunationis dicit, vulgaris .iiii. vel .iiiiia. die post accensionem. Unde non modica multorum oritur admiratio. Alii vero solutionem huius rei querentes dicunt quod congrue fit quod sicut homo post creationem lune .iiii. die primo eam vidit - licet post plenilunium quia omnia in pleno statu creata fuerint - secundum primam illam visionem .iiii. die post accensionem illam primam iudicet. Sunt quibus non placet hec ratio, set potius frivolus videtur, quoniam aliquando .iiiiia. die est accensa antequam prima dicatur. Unde et suam addunt cum scilicet vulgi gratia tabula illa kalendarii facta sit, magis debet lune primatio a lune visione quam ab accensione exordium sumere.

tones that are to find an echo later in Roger Bacon:

Set quam incongruum est latinos viros summa
discretionis in re tam celebri adeo manifeste
errare!¹²

Although he accepts that the Julian solar year is accurate, he establishes a new length for the lunar month which affects the position of the epact.¹³ His emendation of the golden number, however, proposes a solution within the framework of the Julian calendar. He recommends the repositioning of the golden number in the calendar by four days.¹⁴ His calendar demonstrating this change, which also indicates the hour at which the new moon will appear, is often found separately from his treatise, sometimes ascribed to Robert Grosseteste and with a preface (perhaps by the latter).

If the writer of the Compotus ecclesiasticus was aware of the defects in the 19-Year Cycle, why did he not propose an

¹²Digby 40 fol.48v.

¹³Digby 40 44r: Ex quo patet quod epacte que sunt differentie solarium et lunarium annorum non per .xi. dies naturaliter augmentantur ut docet vulgaris compotus set per premissam differentiam scilicet solaris anni et .xii. lunationum.

¹⁴Digby 40 fol.50r: oportet sepe a sapientibus aureum numerum in kalendario mutari quod actum videtur circa primitiva ecclesiam quod et facile fieri posse videtur. Non enim oportet cum iam fere per quatuor dies primatio a veritate discesserit nisi eodem ordine quo omnia in kalendario scripta sunt ordinare, ita tamen ut omnis primatio quarta die ante scribetur quam nunc scribatur.

emendation in his treatise? Roger of Hereford's solution was well enough known to be picked up later by Grosseteste, and perhaps by John of Sacrobosco. The answer is to be found in Bede's explanation of why the Cycle is inviolable. It was held to have been sanctioned by the Council of Nicaea, to have been witnessed to by a miracle, indeed, communicated to the monk, Pachomius, by an angel.¹⁵ The Julian year had no such divine sanction, so that tampering with it was presumably less likely to incur the wrath of the orthodox. Interfering with the Nineteen-year Cycle, on the other hand, was viewed as perilous. Roger was writing a compotus philosophicus, not intended for elementary students, but he "dare not" contradict the Council of Nicaea.¹⁶ John of Sacrobosco was familiar with the sort of emendation Roger proposed, but after stating that the golden number needs to be repositioned in the calendar, he adds the proviso that since it was forbidden by the Council of Nicaea to make any calendar changes, the moderni must sustain the errors it sanctioned.¹⁷

pp.237-240 THE GOLDEN NUMBER

¹⁵DTR cap.XLIII. See C.W.Jones, "A legend of St Pachomius", Speculum 18 (1943), 198-210.

¹⁶Digby 40 fol.48v: nec ipsum propter terminos paschales scilicet lunam .xiiii. a niceno consilio confirmatos mutare audemus.

¹⁷DAR p.482: Sed quia in Concilio generali aliquid de calendario transmutare prohibitum est, oportet modernos adhuc sustinere huiusmodi errores.

The Romans, we are told, first invented tables which gave the phases of the moon for each day of the cycle, and then the Caldeians invented the golden number. Thus a distinction is made between the 19-year Cycle and the ciclus lunaris, which is sometimes confused with it. The writer explains that the later was arrived at by a laborious process of multiplication and division.¹⁸ Robert Grosseteste clearly distinguishes the two in the Compotus correctorius:

Set ciclus primationum qui nunc utimur vocatur ciclus decemnovalis a 19 anni in quibus perficitur. Ciclus vero primationum quo usi fuerunt veteres vocatur ciclus lunaris, et non differt a ciclo decemnovali nisi quia ciclus decemnovalis incipit prius illo tribus annis.¹⁹

This account of the ciclus lunaris is to be found in Chapter LVI of the De temporum ratione, where Bede explains that because it is Roman it starts from 1 January. Jones comments that the lunar cycle is "manifestly extraneous to the Paschal computation."²⁰ As has been said, the golden number does not appear in Bede's treatise.²¹

¹⁸pp.241.

¹⁹Robert Grosseteste, Compotus correctorius ed.R.R.Steele p.246.

²⁰C.W.Jones, Beda opera de temporibus p.388.

²¹p.155.

The golden number makes multiplication and division unnecessary. By this system, each new moon (primation) in the first year of the cycle is indicated by 1 placed against the appropriate dates, in the second year by 2 and so on. What is important to remember is that 1 January = 3, since the new moon falls on 1 January in the third year of the cycle. When these numbers are plotted out on the calendar, two interesting features appear. Firstly, the numbers increase by 8, cycling round the numbers 1-19. The Compotus ecclesiasticus gives two methods for arriving at the number which is to be noted on the calendar. Secondly, these numbers either appear consecutively, or they are separated by one date. When the numbers are consecutive, a larger number precedes a smaller, and when they are separated, a smaller precedes a larger. There are certain exceptions to this rule, which are due to the placing of the embolisms.²²

The verses beginning Aureus hac arte are a metrical explanation of the formation of the golden number. They appear in similar form at the beginning of the Massa compoti of Alexander de Villa Dei.²³ Their popularity was understandable, and they appear in the De anni ratione of

²²A table showing the placing of the golden numbers is printed in O. Pedersen, "The ecclesiastical calendar in the life of the Church" in Gregorian Reform of the Calendar p.67. Note, however, that in the last column the golden nos. 2 and 13 should both occur on 2 December. For the placing of the embolisms, see later, pp.376ff.

²³Massa compoti p.53.

John of Sacrobosco,²⁴ and in the Compotus correctorius of Robert Grosseteste.²⁵ In the latter, they are almost identical to the verses as they appear in the Compotus ecclesiasticus. They also appear separately, as has been said above.²⁶

W.E. van Wijk suggested that the golden number was invented by Alexander,²⁷ although he was later to modify this claim.²⁸ As has already been stated, Roger of Hereford's emendation of the calendar depends on changing the position of the golden number. The golden number, indeed, is one of the constituents of the standard calendar he has already described.²⁹

Roger's treatise would appear to predate the Massa compoti by some twenty-five years. But the golden number was, of course, far older than Roger. It appears not to have been known to Bede, but C.W.Jones listed numerous MSS from the

²⁴p.479.

²⁵Robert Grosseteste, Compotus correctorius pp.257-8.

²⁶p.127.

²⁷Le Nombre d'Or p.31.

²⁸W.E.van Wijk, "Le comput émendé de Reinherus de Paderborn", Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen new ser. 57/3 (1951), 3

²⁹Digby 40 fol.24v: ...de tabula immobilium, scilicet kalendario....latitudine vero illius per iiiior distenditur lineas, in quarum prima continetur aureus numerus....Latitudine vero cum sint lineae .iiiiior. principales, prima aureus numerus eo quod aureis inscribatur literis dicitur quia per hanc etas lune miro artificio dinoscitur.

ninth to the tenth centuries in which the golden number occurs, and a calendar of this kind is printed in Computus vulgaris qui dicitur emphemeris which derived from Abbo and his school at Fleury.³⁰ And A. van de Vijver found evidence that it was known even earlier: he drew attention to Hucbald of Saint-Armand (d.930), whose glosses on a calendar contained in an MS dating from the end of the ninth or the beginning of the tenth century indicate the golden number. He suggests an Irish source for it.³¹

It was van Wijk's contention that if a computistical treatise mentions the golden number, it dates from after 1200.³² This, as we have seen, is untrue. Master William, whose Computus appears to date from 1163, comments that it teaches the age of the moon without recourse having to be made to epacts and regulars.³³ Yet it is possible that although the numbers themselves existed in tabule, it was the verses Aureus hac arte which made them particularly useful to computists, and that verses of this kind were not incorporated into computistical treatises before 1200 or thereabouts. Certainly, there is no mention of the golden

³⁰See p.53.

³¹A. van de Vijver, "Hucbald de Saint-Armand, écolâtre, et l'invention du Nombre d'Or", Mélanges Auguste Pelzer, (Louvain 1947), 78.

³²"Le comput émendé" 4.

³³Digby 56 fol 215va-vb: Alia etiam ars habetur cognoscendi etatem lune in qualibet feria, scilicet aureus numerus qui kalendariis inscribitur Dictus est aureus numerus quia pretiosa est quam aliis. Ipse etiam etatem lune docet singulis diebus absque omni epacte et regulari.

number in the treatises of Helperic and Gerland, and it is not to be found in the Imago mundi of Honorius. Conrad of Strasbourg, on the other hand, appears to take the inclusion of the golden number in his treatise for granted, since he gives no justification for it, although the verses he cites are are not aureus hac arte ...³⁴

It is significant that the golden number is given such a prominent position in the Compotus ecclesiasticus, preceding the discussion of the common and lunar years. Van Wijk commented that this technique rendered the epacts and regulars and "all the ancient apparatus" superfluous.³⁵ For Alexander de Villa Dei it was so important that he dealt with it at the beginning of his treatise, telling us that it is more useful and better than the epact for discovering the age of the moon.³⁶ If compotus was regarded, as it must often have been, as a collection of rules for establishing certain dates in the calendar, this was true enough. But a discipline of this kind would scarcely have found a place in the schools curriculum. Finding the movable feasts by means of epact and regular is more burdensome, but

³⁴Bruges 528 fol 4r: Tamen hoc fallit in quolibet mense cuius lunatio est xxix dierum, et ubi docetur hoc versiculo: Mense brevi lune februs est ars, da cito gunger in quorum quolibet .xix. statim in secundo loco post .xi. ponendus est quod docet hiis versibus: Iulius et reliqui qui restant unde viceni iungunt undeno.

³⁵Le nombre d'or p.31.

³⁶Massa compoti p.52: Quoniam doctrina epactarum fallit, ideo excogitatus est numerus valentior et melior a Julio Caesare ad cognoscendum aetatum lunae, qui dicitur aureus.

intellectually sounder; and certainly an understanding of the difficulties inherent in the 19-year Cycle could not be achieved on the basis of the golden number alone. The Computus ecclesiasticus is evidence that an understanding of the principles behind the rules was required, and that the older techniques were therefore not discarded. It is characteristic of Robert Grosseteste that a thorough examination of the epact and lunar regular precedes his description of the Golden Number.

pp. 242-4 THE COMMON LUNAR YEAR

The common lunar year is made up of 12 lunations of alternating 30- and 29-day lengths, and so it contains 354 days, eleven days less than the solar year. The epact, which is the age of the moon at the beginning of the year, is joined with the lunar regular to show the age of the moon at the beginning of each solar month (this will be explained in detail later).³⁷ A Dionysian argumentum is given to find the age of the moon in a future or past year on any date for which this is already known,³⁸ and a straightforward mnemonic added.

pp. 244-254 THE EMBOLISMIC YEAR:

After three common years containing 354 days each, the

³⁷pp. 254ff.

³⁸See Dionysius, Argumenta Paschalia, PL 67, 499A.

lunar calendar lags 33 days behind the solar. At this point therefore an extra lunation of 30 days is intercalated, and added to the third year, making a lunar year of 13 lunations, the embolismic year. Whenever the lunar calendar lags behind the solar by a sufficient amount, a similar intercalation is made, with a little juggling between the eighth and ninth years - a point neatly indicated by the division of the cycle into an 8-year period, the ogdoas, and an eleven-year period, the endecas. The embolisms are intercalated at the point at which the compensation becomes necessary.

pp.245-247 OGDOAS AND ENDECAS:

The above is a simplified explanation of a mechanism which is complicated by the necessity of placing the embolisms at that point in the year where they will be least disruptive.³⁹ The computist first explains how the embolisms are collected from the "excess" of days in the solar year in comparison with the lunar one. The division into ogdoas and endecas, I have suggested, makes the calculation more manageable, but its only other practical value was "to remind the computist that in the eighth and nineteenth years the embolism came after one

³⁹So Gerland, Digby 56 fol 172v: Si hic queras quare omnes embolismi non locantur in fine suorum annorum, scias hoc magna industriai factum esse, ne forte epacte mentirentur si alibi locarentur. On this, see Van Wijk, Le Nombre d'Or p.14-15.

common year instead of two".⁴⁰ The ogdoas appears to have been, as Bede suggested, a survival of an earlier attempt at constructing a lunar-solar cycle:

quia antiquis visum est octo annos solares totidem
lunaribus annis dierum numero aequari.⁴¹

The scheme into which the embolisms are inserted is the cycle of epacts, although it is not given this name here. What is important to remember is that this cycle, as the computist has told us above, begins in September.⁴²

The survival of the words ogdoas and endecas seems to have been an historical curiosity. Bede's account of the ogdoas and endecas is to be found in Chapter XLVI of the DE temporum ratione, which is, according to Jones "one of the more popular chapters".⁴³ Roger of Hereford's Computus contains a passage that is very similar to the treatment here,⁴⁴ although Constabularius mentions the division of the 19-year Cycle into ogdoas and endecas without elaboration.⁴⁵ John of Sacrobosco discards them altogether, but in the Computus correctorius Grosseteste explains the

⁴⁰C.W.Jones, Beda opera de temporibus p.380.

⁴¹DTR p.263.

⁴²See p.210.

⁴³Beda opera de temporibus p.381.

⁴⁴Digby 40 fol.30r

⁴⁵Cot.Vit.A XII fol 90ra.

formation of the embolisms in a passage which seems to be based on the Compotus ecclesiasticus, and later defines ogdoas and endecas.⁴⁶

pp.247-8 THE PLACING OF THE EMBOLISMS.

Two mnemonics present a useful way of remembering where the embolisms are intercalated (we remember that only 8 days were allocated in the Oxford syllabus for compotus):

p.247,10 Mobilis ibo ciphos ace liber habeto coevum.

The 7 words "serve" the 7 embolismal years. The initial letter of the first syllable gives the month; the initial letter of the second syllable the day of the month. The embolisms are intercalated, therefore, on 2 December, 2 September, 6 March, 3 January, 2 November, 2 August, 5 March.

p.248,8 Christe factus homo levat omnia reddita trono.

The compotist tells us that the initial letters of each word indicate the embolismic years, i.e., years 3,6,8,11,14,17 and 19 of the 19-Year Cycle. If we are to accept what he has to say later about the errors in the embolisms, it would appear that this mnemonic refers not to

⁴⁶Compotus correctorius p.244-245; p.246.

the 19-Year Cycle, but to the cycle of epacts.⁴⁷

Both mnemonics seem to have been well-known. They appear in the Massa compoti;⁴⁸ an independent citation of mobilis ibo in a twelfth century MS is recorded by Cordoliani.⁴⁹

pp.249-254 THE ERRORS IN THE EMBOLISMS:

It should be emphasised here that the the first three "errors" which are detailed so minutely have no bearing on the actual problems of the calendar: rather, they are intrinsic to the Nineteen-year Cycle. Only the last, the fact that in certain places the epacts "lie", would seem to be of real importance, a point that Conrad of Strasbourg appears to appreciate.⁵⁰ This is a difficulty that the compotist will deal with after he has explained the working of the epact and lunar regular in more detail.

The errors of vicissitude, termination and variation break

⁴⁷But cf Compotus correctorius p.246, where Grosseteste clearly places this mnemonic in the context of ciclus decennovenalis.

⁴⁸Massa compoti p.60.

⁴⁹"Contribution à la littérature du comput ecclésiastique" II 196.

⁵⁰Bruges 528 fol 4v: Contingit autem duplex insolenti ex embolismalibus lunationibus, quarum altera est quod plures lunationes .xxx. dierum continuo sese sequerentur, reliqua quod plures lunationes propriis mensibus non terminantur, quod patet consideranti interkalationem in kalendario. Item ex eodem unus verus error contingit: fallit enim regula epactarum assignata in tribus annis embolismalibus propter embolismum.

certain rules that have already been given. The error of vicissitude occurs in all seven embolismic years. We have been told that the lunation is actually 29 days 12 hours long, but that computists reckon one lunation of 30 days, followed by one of 29.⁵¹ Since the intercalated embolism is 30 days long, it interrupts the alternation of "full" and "hollow" months, and the error is compounded in the first, third, fourth and seventh embolismic years if they are leap-years. The error of termination occurs in the third, fourth and seventh embolismic years. The student has been told that the lunation is said to belong to the month in which it finishes, and this is reinforced by a well-known mnemonic:

Mensi luna datur cui fine suo sociatur.⁵²

The error of variation breaks a third rule, that a lunation containing an equal number of days is attributed to an unequal month, i.e., January, March, May, etc., and the rule is again reinforced by a mnemonic:

Impar luna pare, par fiet impare mense.⁵³

⁵¹ p.235.

⁵²p.235. It has a slightly different form in the Massa compoti, p.59: Illius est mensis, quo dat lunatio finem.

⁵³ p.236. Cf. Massa compoti p.60. That this is the meaning of the mnemonic is borne out by the Compotus correctorius p.244: ... scias quod omnis mensis impar, ut primus et tertius et quintus et sic deinceps, habet lunationem 30 dierum, et omnis mensis par, ut secundus et quartus et deinceps, habet lunationem inparem, scilicet, 29

The Computus ecclesiasticus does not detail where the error of variation occurs, but this is self-evident.

Apart from these errors, and the error of the epacts which the computist will deal with in more detail later, another anomaly appears in the first, second, fifth and sixth embolisms. The computist tells us that the embolisms are differently assigned according to "our cycle" (i.e., the 19-year Cycle) and "the cycle of those who discovered the embolisms" (i.e., the cycle of epacts). This is because the latter cycle begins in September, four months earlier than the 19-Year Cycle, which begins in January. This means that, for instance, the third embolism, which should appear in the third year of the cycle, and indeed does in the cycle of epacts, is at the end of the second year in the 19-Year Cycle.

p.254 si alibi ponerentur plures contingerunt errores et plures menciuntur epacte] the unsatisfactory results of the placing of the embolisms were known well before the Computus ecclesiasticus. Material dealing with this problem can be traced back to the De ratione computandi, dated by its editor, it would seem, to the first half of the seventh century.⁵⁴ The anonymous Liber de computo, which dates from

dierum.

⁵⁴De ratione computandi, ed Dáibhí O Cróinín (Pont.Inst.Med.Stud., Toronto 1988), p.184. As regards the dating of the text, O Cróinín is cautious. He says (p.101): "Cummian's Letter is a unique guide to the number of [computistical] texts available in southern Ireland during

the beginning of the ninth century, contains similar material,⁵⁵ as does the Manfredi embolismorum ratio, which, according to C.W.Jones, predates it.⁵⁶ The Liber de computo of Helperic deals specifically with the error of vicissitude,⁵⁷ and Roger of Hereford describes the error of termination.⁵⁸ Alexander deals with the latter, but not with the former.⁵⁹ Conrad of Strasbourg deals with both.⁶⁰ But in none of these texts is the topic dealt with as simply and as comprehensively as it is in the Computus ecclesiasticus, although both John of Sacrobosco and Robert Grosseteste appear to have imitated this passage.⁶¹

pp.254-261 THE EPACT AND THE LUNAR REGULAR:

The epact and lunar regular are defined in terms which clearly echo the earlier exposition of concurrent and solar regular.

the first half of the seventh century; the De ratione computandi offers an insight into the structure and content of a typical Irish computus."

⁵⁵PL 129, 1335-8. For the date of this, see C.W.Jones, Bedaes Pseudepigrapha (Oxford 1939), p.80.

⁵⁶Manfredi embolismorum ratio PL XC 821-824A. Jones's comment is in Bedaes Pseudepigrapha p.80

⁵⁷Helperic, Liber de computo, PL 137 48A-B.

⁵⁸Digby 40 fol 25r: Et dicitur semper lunacio illius mensis in quo finit, nisi quando per .xiiia. fit impedimentum.

⁵⁹Massa compoti p.60

⁶⁰Bruges 528 fol.4v.

⁶¹DAR pp.486ff; Computus correctorius pp.249-252.

The solar year of 365 days exceeds the lunar year of 354 days by roughly 11 (the Julian solar year is actually 365.25 days). The 11 days at the end of the first year of the 19-year Cycle become the epact of year 2. What this means is that if the moon is new (luna 1) on 1 January, as it is in the 3rd year of the cycle, in the next year on 1 January it will be luna 12, and the year after luna 23. But no epact can be more than 30, for 30 days make an embolism; if this number is reached, it has to be subtracted, and the difference is the epact of the following year.

Three methods of finding the epact of any particular year are explained:

p.255, 12-3 Que tenet undenas]

The age of the moon on 22 March in any particular year indicates the epact of that year. This is the sedes epactarum.⁶²

p.256, 3 Predocet epactam]

AU add the explanation: add 11 to the Golden No. on 1 May to find the epact of the next year.

6 Deme unum post adde novem post undevicenos]

⁶²See Le Nombre d'Or p.120. The mnemonic appears also in the Massa compoti p.59, and in the Computus of M.William, Digby 56 fol 214vb.

How to find the epact of any year of the 19-year Cycle by means of computus manualis. Count the 19 years of the cycle on three positions on the thumb, starting from the bottom. If a year falls on the base of the thumb, subtract 1; if in the middle, add 9; if at the tip, add 19. Thus the epact for year 1 is $1-1=0$; for "the first year of the cycle has no epact"; the epact for year 14 is $14+9=23$; the epact for year 18 is $18+19-30=7$.

Bede deals with the epact in Chapter L of the De temporum ratione. Similar passages are to be found in Helperic and Gerland, and in the Imago mundi of Honorius.⁶³

The lunar regular, joined with the epact, gives the age of the moon at the beginning of a particular month. Like the solar regular, it expresses the relationship of the first day of each month to the first day of the following one. The lunar regular, like the cycle of epacts, begins from 1 September. An explanation of this is given by Helperic:

Epactae istae cum suis regularibus idcirco a Septembri initium sumunt, quod Aegyptus, caeterarum gentium in hac arte magistra, ab hoc mense annum inchoavit.⁶⁴

In the last year of the 19-year Cycle - which is the 1st

⁶³Helperic, Liber de computo PL 137, 29C; Digby 56 fols 172v-173r; Imago mundi p.111.

⁶⁴Helperic, Liber de computo Cap.xiii, PL 137, 29D-30A.

year of the cycle of epacts - 1 September is luna 5. This then is the September regular, from which the others are calculated.

Various ways of finding the lunar regulars are explained:

p.258, 2-5 Sume dies septembris]

The lunar regular for September is added to the number of days in the solar month; the September lunation is subtracted, and the resulting number is the lunar regular for October: i.e., $30+5-30=5$ (remember that lunations of 30 and 29 days alternate: September is an "unequal" month, and therefore it has an "equal" lunation of 30 days). The beauty of this scheme is that it is not affected by the embolism: if one occurs, it is simply deducted.

7-8 Quinque sep oc dantur no de 7 ter tria mar
feb a decem sumant post unum cuilibet addas]

A mechanical way of remembering the above. 5: September, October; 7: November, December; $3 \times 3 = 9$: March; 10: February, April; for May June July and August add 1 to the preceding number, i.e., 11,12,13,14.

10 Post E bis G bis I K bis manet ordo]

The same series of numbers expressed more succinctly: twice

5, twice 7, twice 9 and 10; then "the order is kept" -
11,12,13,14.

12-13 Estuat esurit ...]

The initial letters of the 12 words give the lunar
regulars, starting of course from September.

pp.259-261 THE FAILURE OF THE EPACTS:

In the 8th, 11th and 19 years of the cycle, if we calculate
as has been explained above, the age of the moon is shown
inaccurately, as set out below (the correct age is shown in
brackets). To understand the problem, it is necessary to
know how to calculate the age of the moon by epact and
regular; it is for this reason that the compotist, when
dealing with mistakes in the embolism, postpones his
discussion of this point.

Year 8, 1 May: epact 17 + regular 11 = 28 (27).

1 July: epact 17 + regular 13 = 30 (29).

Year 11, 1 March: epact 20 = regular 9 = 29 (28; except
in leap-year).

Year 19, 1 May: epact 18 + 11 = 29 (28).

1 August: epact 18 + 14 - 30 = 2 (3).

The last anomaly is the result of the saltus lune, as the
writer explains. It will be noted that all the problems

occur in embolismalic years, and it is the intercalation of the embolism, although he does not explain this, which is the cause of the other anomalies. Thus, in the 8th year of the cycle there is an embolismic month from 6 March - 4 April (inclusive). The April lunation is of 30 days (April is an "odd" month, so the lunation is "equal"). The writer pointed out to us earlier that the embolism causes the error of termination here - the April lunation finishes in May - but worse still, if we count from the beginning of the lunation (5 April, luna 1; 6 April luna 2 and so on) we find that luna 27 falls on 1 May. And this is not what calculating the age of the moon by epact and lunar regular tells us. The other errors are of a similar kind.

It is not surprising that Grosseteste was to comment that if they were to get at the truth, another way of establishing the age of the moon at the beginning of the months must be sought.⁶⁵

That the placing of the embolism caused the epact to "lie" in the eighth, eleventh and nineteenth years was known to Bede,⁶⁶ and was to become a computistical commonplace.⁶⁷

⁶⁵Computus correctorius p.236: Necesse est itaque nobis ad veritatem cognoscendam ut alia via queramus numerum etatis lune in principiis mensium nostrorum quam per ciclum epactarum.

⁶⁶DTR p.221: Sunt autem anni tres circuli decemnovenalis in quibus argumentum stabilitatem sui tenoris conservare nequeat: octavus videlicet, undecimus et nonus decimus - cui causa nutandi varia facit ac dispersa per annum embolismorum insertio.

Bede gives no value for the smallest of the units in the Compotus ecclesiasticus, the atom. Teachers of arithmetic (calculatores), he tells us, give different names to the smallest space of time, the time taken to blink the eye, sometimes moment, sometimes point, sometimes atom.⁶⁸ In his earlier, more elementary work, the De temporibus, he quotes Isidore to the effect that the moment is the smallest unit of time.⁶⁹ Isidore tells us also that the atomus temporis is that particle of time that cannot be divided,⁷⁰ but this is not repeated by Bede.

In the Compotus ecclesiasticus the value of the atom is given as 1/47 uncie. This is a computistical commonplace that has puzzled some recent commentators, although it was

⁶⁷Thus it is to be found in Helperic, PL 137 46C-47D, and in Gerland, Digby 56 fol 171v-172r; and in Constabularius, who adds, Cot.Vit.A XII fol 91va: Set multo melius erat epactas mentiri quam pascalem rationem vacillare. Roger of Hereford deals with the question on Digby 40 fol 30v; it is to be found in the Massa compoti p.59.

⁶⁸DTR p.184: "Nec praetereundem quia etsi calculatores necessario discernant, plurimi scriptores indifferenter brevissimum illud temporis spatium quo palebra oculi nostri moveri potest, quod in ictu pungentis transcurrit, quod secari et dividi nequit, nunc momentum, nunc punctum, nunc atomum vocant".

⁶⁹DT p.295 (quoting Isidore, Etym V.30): "Momentum est minimum atque angustissimum tempus a motu siderum dictum".

⁷⁰Isidore Etym. XIII 2.

explained long ago by Tannery.⁷¹ The value is arrived at by working backwards from the 235 lunations of the 19-year Cycle. The value is specific to the saltus lune. As has been said, the 19-year solar cycle contains 6939.25 days, the 19-year lunar cycle 6340.25: the saltus lune is the omission of one day from the latter which enables it to be equated with the former. The calculation relating to the saltus lune, like that for the bissextile, is based on the apportionment of an awkward bit of time, in this case to be subtracted rather than added. Each of the 235 lunations of the 19-year Cycle, we are told, is too long by 4 moments, 1 uncia, and 1 atom: for this is the quotient arrived at if the 24 hours (i.e., 960 moments) by which the lunar cycle exceeds the solar is divided by 235. The division presents problems. If 960 moments are shared out between 235 lunations, 20 are left over. These can be converted into 240 uncie, but if these are shared out, there are 5 uncie left over - $5/235$ uncie, i.e., $1/47$ uncie, which must therefore be the value of 1 atom. The calculation here is a rather painful reversal of this process, although the introduction of the uncia from the Roman system of duodecimal fractions makes the calculation easier.

Bede's treatment of the saltus lune is in Chapter XLII of the De temporum ratione, but his calculation which makes no use of the atom, is simpler. The calculation which is to be

⁷¹See R.R.Steele, Opera hactenus inedita fratris Roger 6, 291.

found here is to be found also in Helperic and Gerland, and in the Massa compoti,⁷² and can be traced back to the De cursu et saltu lune of Ps. Alcuin where the atom is defined as 1/564 of a moment.⁷³

p.261 Est autem saltus lune subtractio unius diei a lunatione iulii in ultimo anno cicli decennovenalis]

A very similar statement is to be found in the Computus of Gerland:

Saltus lune nichil aliud est quam detraccio unius diei a toto .xix^{li}. ciclo⁷⁴

pp.263-4 THE MOBILE FEASTS.

The mobile feasts are Septuagesima, Quadragesima, Easter, Rogationtide and Pentecost. The computist has explained how to find dates in the 19-Year Cycle by means of the golden number, and by epact and lunar regular. The passage on the mobile feasts introduces a third method, using terms and claves. This technique, which is not described by Bede, was strictly superfluous if you knew how the golden number

⁷²Helperic, Liber de computo, PL 137, 32C-34A; Gerland, Digby 56 fol 172v; Massa compoti p.60.

⁷³PL 129, 986B: quingentesima quinquagesima decima quarta parte momento

⁷⁴Digby 56 fol 172v. Roger of Hereford (Digby 40 fol 31r) and M. William (Digby 56 fol 215rb) have similar definitions.

worked; but it is easy to see why it exercised a fascination for computists, and its treatment here demanded more from the student than simple rote-learning.

The Computus of Roger of Hereford describes the mobile feasts in a similar way.⁷⁵ Similar material is to be found in the De ecclesiasticis officiis of John Beleth.⁷⁶

pp.265-274 THE TERMS AND CLAVES.

In this system, it is necessary to establish first the Easter term, since the other mobile feasts depend on it. Easter is related to the Jewish Passover, which occurred at the full moon, luna xiv (Exodus 12,6). This fourteenth day of the lunar month of March is the Easter term. Easter Day itself is the Sunday following. The other mobile feasts are related in the same way to their terms.

⁷⁵Digby 40 fol 23r: Sunt autem quinque: septuagesima, quadragesima, pascha, rogationes, penthecostes. Septuagesima vero numerus est annorum exilii pro peccatis, ubi non cantatur canticum domini; unde nos pro peccatis nostris tamquam in exilio repentantes a cantibus hoc tempore quibus iubilus ecclesie specialiter exprimitur, abstinemus tempus quod illud septuagesimam appellamus. Quadragesimam vero quando etiam exemplo domini, helye, moisy a licitis escis abstinemus, decimando et purgando corpora nostra contra pascha. Pascha vero greco phase hebraice transitus latine dicitur, que revocamus ad memoriam creationem mundi quando factus est transitus de nonesse ad esse, et transitum filiorum israelis de egypto, et Christi de mortalitate ad immortalitatem, et nostram fururam transitionem de hoc mundo ad posterum.

⁷⁶John Beleth, De ecclesiasticis officiis pp.141,211,212,248.

The earliest date on which Easter Day can fall is on the Sunday following the term, which is itself fourteen days after the beginning of the earliest possible April lunation. According to our compotist, this earliest lunation occurs in Year 16 of the Nineteen-year Cycle, and it actually begins on 8 March (the student can check this, because in the calendar, 8 March - 8 id.Mar. - has the golden number 16 beside it). In all the other years the April lunation begins later, and therefore Easter is correspondingly later. The dates between which Easter Day can fall - the Easter Limits - are 22 March to 25 April inclusive.

The clavis is, or should be, the number of days between the beginning of this earliest possible lunation and the Easter term for any particular year. If you know the date of this beginning, which is the sedes clavis, you can add on the clavis, which is a pre-determined number of days (see later). This will give you the Easter term, and the following Sunday will be Easter Day (of course, you need to know where that following Sunday is, but you can establish that easily enough by means of the Dominical letter, or by concurrent and solar regular, both of which our compotist has already explained).

Here, however, we meet a problem. We would expect 8 March to be the sedes clavis for the Easter term, and the clavis for year 16 of the cycle to be 14. In fact, as Alexander de

Villa Dei and Robert Grosseteste state clearly, and as is evident from the methods for finding the claves described in the Computus ecclesiasticus, the Easter sedes clavis is 11 March, and the clavis for year 16 of the cycle is 11. This gives the required term of 21 March, and the earliest day on which Easter can fall (the first Easter Limit) is thus 22 March.

What we have here is evidence, like the fact that they begin from 1 January, of the Roman origin of the claves.⁷⁷ If 14 days are counted inclusively from 11 March, we reach 24 March; the first Easter limit would thus be 25 March. But this was the date of the Roman equinox, with which it had originally been identified.⁷⁸ The clavis appears to have been changed to 11 to accommodate the Easter Limits 22 March - 25 April, which were those eventually accepted by the Church.

p.265, 5-6 ne videamus Iudeos imitare] If the Easter term falls on Sunday, Easter Day must be celebrated on the following Sunday; it can never be celebrated on the term itself "lest we appear to imitate the Jews". This apparently simple observation refers to the Quartodeciman controversy which threatened to split the early Church apart. Although the details of the controversy are obscure, it appears to have been originally between those who

⁷⁷See above, p.295.

⁷⁸See C.W.Jones, Bedae opera de temporibus p.20ff.

observed a Christian Passover on the fourteenth day of the Jewish month Nisan, whatever day of the week it happened to be, and those who observed Easter Day on the Sunday following.⁷⁹

p.266, 4 Theophilus Alexandrie episcopus] The compotist is mistaken in attributing the statement that the Passion of Christ took place on X kal.Apr. to the Bishop of Alexandria. The indirect source of the statement seems to be Bede, and the compotist's mistake is evidence of his use of the Compotus of Gerland. In Chapter XXIV, Quid diversi senserunt de passionis et resurrectionis Domini, Gerland quoting De temporum ratione Chapter LXI refers to Theophilus, Bishop of Alexandria:

Salvator noster sicut Theophilus cuius supra memini venerabilis Alexandrie episcopo scribit .xiiii. luna quidem traditus est, hoc est .v. feria post sabbatum; .xv^a. autem crucifixus, die tertia resurrexit, hoc est .xvii. luna, que tunc in dominica die videtur inventa, sicut et evangeliorum observatione comperimus.

He continues in his own words:

Ut igitur hec controversia breviter de passione et resurrectione Domini comprehendatur, Dionisius et

⁷⁹See C.E.Richardson, "A new solution to the Quartodeciman riddle", Journal of Theological Studies, New Series 24 (1973), 74-84.

quidam alii salvatorem nostrum passum esse .viii. kal. aprilis estimarent. Theophilus autem .x. kal aprilis esse passum intellexit.⁸⁰

But the reference here is to Theophilus of Caesarea, the supposed author of the Acta synodi. The juxtaposition of the two bishops seems to have misled the writer of the Compotus ecclesiasticus.

The idea that Christ was crucified on the same date as Adam was created is credited by Bede in Chapter LXVII of the De temporum ratione to Theophilus of Caesarea.⁸¹ The passage is quoted verbatim by Gerland later in Chapter XXIV of his Compotus:

Unde mento creditur si non verior sententia vincit quam beatus Theophilus cum ceteris non solum Palestine sed etiam permultis aliarum regionum episcopis de Pascha disputans scripsit eodem .x.kal.aprilium die Dominum fuisse crucifixum. Decebat enim una eademque non solum ebdomadis sed et mensis die secundum Adam pro salute generis humane vivifica morte sopitum de productis elatere suo sacramentis celestibus sponsam sibi sacrificare ecclesiam qua videlicet die primum

⁸⁰Digby 56 fol.176v.

⁸¹ Printed in Chronica Bedae, ed. Theodore Mommsen (MGH Auctores Antiquissimi xiii (Berlin 1898), 249.

Adam priorem humani generis ipse creaverit.⁸²

The Acta synodi can be found most conveniently under the title De ordinatione feriarum paschaliu.⁸³ It has been said by some to have been an Irish forgery. Jones follows Wilmart in his opinion that the text originated in Africa.

Why should the compotist choose to quote this rather obscure text at this point? The context in which it is cited by Gerland is entirely different (there is no reference to claves in the latter writer). Its relevance here appears to be to the question of the Easter Limits. The Acta synodi was a polemical tract whose aim was to establish the Easter Limits 22 March - 21 April, and it is quoted to this effect by Bede:

Constitutumque est in illa synodo, ut ab xi kal.apr. usque in xi kal.maias Bede pascha debeat observari.⁸⁴

It is interesting that Gerland, who usually quotes Bede with great accuracy, changes the second date here to bring it into line with Church practice:

Constitutumque est in illa sinodo ut ab xi kal.Apr.

⁸²Digby 56 fol.177r.

⁸³PL 90, 607-610.

⁸⁴DTR p.268.

usque v^oiii kal.Maii Pascha observari debeat.⁸⁵

pp.269-71 quidam numeri qui claves dicuntur] The clavis for the first year of the 19-Year Cycle is 26: the claves for the following years can be found by the addition of 19, as the mnemonic records.

Two other ways of finding the claves follow, both involving the technique of the Compotus manualis. It must have seemed more than a happy accident that the joints and tips of the fingers and thumb of one hand add up to represent the 19 years of the cycle.

p.270,3-7 computetur per omnes iuncturas..] If you start from 26, and beginning at the base of the thumb, count on through the 19 joints and finger-tips, remembering to deduct 30 when you reach the number 40, the number you arrive at on the tip of the little finger will be 15, which is the clavis of the second year of the cycle; and so on.

10-271,2 Vicenos quinos...] Alternatively, number the thumb and finger-tips of one hand in the following sequence: 25;13;31;19;7. Count round the years of the cycle. The addition of the year and the number represented on the digit will give you the appropriate clavis.

p.271, 4-5 In iano prima] To find the position of the term,

⁸⁵Digby 56 fol.176v.

you need also the locus clavis. This mnemonic should supply them. I am at a loss to interpret it, and so, apparently, was van Wijk;⁸⁶ but luckily Grosseteste explains what it means:

Locus autem clavium termini Septuagesime est super primum C Januarii, scilicet septimo Idus illius, et locus clavium terminorum Pasche est super G martii, scilicet quinto Idus illius. Locus autem clavium terminorum Rogationum est super tercium G Aprilis, scilicet 17^o kalendas Maii. Et locus clavium terminorum Pentecostes est super ultimum G Aprilis, scilicet 3^o kalendas Maii.⁸⁷

The Massa compoti contains another, more comprehensible mnemonic for the loci or sedes clavium:

O, sedes clavis, hii quinque dies tibi dantur:
septima de capita Jani de fineque quarta,
Martis et undena de vertice, fit et Aprilis
vertice quindena simul et de fine secunda.⁸⁸

In either case, the indicated dates are 7 and 28 January, 11 March, 15 and 29 April.

⁸⁶See Le Nombre d'Or p.105.

⁸⁷Computus correctorius p.261.

⁸⁸Massa compoti, p.55. On p.104, where van Wijk comments on this, the last date appears as 9 May; but this must be a printing error.

As promised,⁸⁹ the computist completes his discussion of the larger divisions of time by describing the lustre, the indiction, the century and the age.

C.W Jones notes that "when Bede wrote, the Indictions were being used as a method of dating historical events".⁹⁰ Dionysius and Bede himself were responsible for the adoption of the Era of the Incarnation. But indictions continued to be noted on the calendar. The writer of the Computus ecclesiasticus provides some justification for this, at least in liturgical terms.⁹¹ Perhaps the source of this passage is to be found in the De ecclesiasticis officiis of John Beleth, where a reference to the inscribing of the year of the indiction on the Paschal candle is to be found.⁹²

Bede explains the division of the indiction into 5-year periods or lustra.⁹³ His source appears to have been

⁸⁹p.191.

⁹⁰Beda's opera de temporibus p.383.

⁹¹p.275: Nos vero in tribus utimur indictione, in privilegio, in cereo paschali, in dedicationibus ecclesiarum.

⁹²De ecclesiasticis officiis p.201: Indictio quoque et era et epacta in cereo scribuntur, quoniam actiones hominum et successiones temporum per Dei dispositionem ordinantur.

⁹³DTR Cap.XLVIII.

Isidore,⁹⁴ but the designation of different kinds of tribute to each lustrum seems to be a later embellishment. It is to be found in Helperic⁹⁵ and Honorius. The editor of the Imago mundi refers to "the early version" of a commentary by John Scotus Erigena on the De nuptiis of Martianus Capella.⁹⁶ Whatever its source, it established a place in Schools compoti: Honorius, M. William, Constabularius, Roger of Hereford M. Conrad and Alexander de Villa Dei all have it.⁹⁷

⁹⁴Isidore, Etymologiae v, 37,1; De natura rerum vi 195-7.

⁹⁵Computus Helperici, PL 137 57D.

⁹⁶V.I.J. Flint, "Honorius Augustodunensis, Imago mundi", 109.

⁹⁷Cot. Vit. A XII fol 89va; Digby 40 fol 33r; Digby 56 fol 216va; Massa compoti p.56.

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LIBELLUS IO/ANNIS DE SACRO BU/STO, DE ANNI RATIONE,/ SEU
UT VOCATUR VULGO, COM/PUTUS ECCLESIASTI/CUS

Cum Praefatione Philippi Me/lanthonis

Mense Augusto /Anno M.D. XXXVIII

(Reproduced with modified punctuation from the edition printed, with a preface by Philip Melanchthon, at Wittenberg in 1538. Passages which are similar in wording to the Compotus ecclesiasticus are italicised.¹)

¹See p. 109.

PROEMIUM AUTORIS.

Computus est scientia considerans tempora ex solis et lunae motibus, et eorum adinvicem coaequatione distincta. Fecit enim Deus duo luminaria magna, ex quorum beneficio dies et nox illuminantur, et temporum vices, humanae fragilitati famulantium efficiuntur. Ecclesia itaque non de motibus universorum corporum curans supercoelestium, tempora mensura ac distincta secundum motum istorum duorum planetarum solum intendit. Unde hanc scientiam Ecclesiae subalternatam ab astronomia distare constat, quae de motibus astrorum omnium universaliter exequitur. Haec vero temporum discretionem secundum cursum solis et lunae tantum metitur. Quicquid etiam astronomus de temporis fractionibus determinat, fit gratia motus astrorum; ipsius enim est motum ipsum considerare, computistae vero temporum discretionem. Unde miro artificio illius aequalitas in astrorum et planetarum motibus minutissime consideratur, huius vero grossa inaequalitate per temporum spacia nunc maiora, nunc minora, ut in omnibus sufficiat, comprehenditur. Tempus autem est effectus corporum supercoelestium motus, ex quo quantitas dimensionem et numerum et qualitatis alterationem sortitur.

Computista autem partes temporis quandoque die maiores, quandoque minores determinat. Partes temporis die maiores sunt septimana, mensis, annus, lustrum, indictio, saeculum et aevum, de quorum singulis per ordinem in

consequentibus dicetur. *Partes temporis die minores sunt quadrans, hora, punctus, momentum, uncia et atomos.*

DE PARTIBUS TEMPORIS MINORIBUS DIE.

Quadrans est quarta pars diei naturalis, id est, sex horarum integre comprehensio. Hora est vigesima quarta pars diei naturalis. Horarum vero alia naturalis, alia aequinoctialis. Naturalis est spacium temporis quo medietas signi peroritur. Aequinoctialis vero est 15 graduum circuli aequinoctialis supra horizontem ascensio, verumtamen utraque illarum naturalis, nisi discretionis causa poterit appellari. Punctus quidem in solari computatione est quarta pars horae unius, in lunari vero, quinta. Momentum est decima pars puncti prout prius sumebatur punctus. Uncia vero est duodecima pars momenti. Atomos est 48. pars unciae. Astronomica tamen per 60 usque ad minimum cuiuslibet integri uniformis est fractio. Cum igitur in istarum temporis partium et differentiarum computatione huius scientiae consistat completio, a computando nomen computus accepit, non quod computare doceat, sed quoniam numeris certis et subtiliter coniunctis doceatur.

DE DEIBUS NATURALIBUS ET ARTIFICIALIBUS.

Dierum autem alius naturalis, alius artificialis. Naturalis est 24 horarum a quocunque quatuor punctorum

meridiani vel horizontis sole inceptarum continua
comprehensio, id est diei et noctis completae spacium.
Unde illud *Genesis*: Factum est vespere et mane dies unus.
Item, Qui mane iunctum vesperi,
Diem vocari praecepis. Dies vero artificialis est spacium
temporis ab ortu solis usque ad eius occasum, unde
artificialis dies est sol lucens super terram. Nox autem
est umbra terrae, in solis oppositum diametraliter
extensa. Et dicitur nox a noceo nocēs, est enim tempus
nocentibus aptum.
*Notandum igitur quod dies naturalis secundum diversos
diversa habet principia. Romani enim diem naturalem a
media nocte incipiunt, et ibidem terminant, quoniam
legitur quod Dominus natus fuerit in medio noctis diei
Dominicae, et quoniam sol quae causa est diei a puncto
remotissimo in media nocte incipit ascendere. Arabes vero
a meridie incipiunt, qui dicunt solem fuisse factum in
meridie, secundum cuius motum diem considerant. Iudei
autem a vespere, innitentes illi auctoritati *Genesis*,
Factum est vespere et mane dies unus. Quidam etiam
secundum sensum agentes, ut vulgus, diem naturalem ab
ortu solis incipiunt, quia cum sol sit causa diei, tunc
merito debet dies incipere cum sol effertur supra nostrum
horizontem. Est autem horizon circulus, quem sibi
circumscribit cuiusque aspectus. Meridianus vero est
circulus quem sol a polo ad polum per hominum verticam
transeuntem die media designat. Huius itaque diei
secundum medicos quatuor distinguuntur quadrae: quarum*

prima est ab hora noctis nona usque ad tertiam diei calida, et humida, in qua sanguis movetur; secunda vero a tertia diei artificialis usque ad nonum eiusdem calida est et sicca, in qua cholera eventatur; tertia a nona diei artificialis usque ad tertiam noctis, frigida et sicca, in qua melancholia multiplicatur; quarta est a tertia hora noctis usque in nonam eiusdem, frigida et humida, in qua phlegma fluctuat. Unde versus:

Tres lucis primas, noctis tres sanguinis imas,
Vis Cholerae medias lucis sex vendicat horas,
Datque Melan primis noctis, tres lucis et imas,
Centrales ponas sex noctis phlegmatis horas.

Dies artificialis similiter in quatuor quadras ab autoribus dividitur: quarum prima rubens, secunda splendens, tertia urens, quarta tepens dicitur. Unde sol quatuor equos habere fingitur, quorum nomina sunt haec: Eous, Lampas, Pyrois, Phlegon. Unde versus:

Solis equi lucis dicuntur quattuor horae,
Haec rubet, haec splendet, haec calet, illa tempet.

Notandum etiam quod dies septimanae secundum diversos diversas habent appellationes. Philosophi enim gentiles quemlibet diem septimanae ab illo planeta qui dominatur in prima hora illius diei denominant. Dicunt enim planetas successive dominari per horas diei quorum

*nomina et sphaerarum ordinatio in subscripta figura
clarescunt.*²

Post SIM SVM sequitur ultima Luna subit.

Vel ordine retrogrado sic.

Cynthia, Mercurius, Venus et Sol, Mars, Iove, Satur.

Ordine retrogrado sibi quivis vendicat horam.

*Supponatur igitur quod Saturnus dominetur in prima hora
die Sabbati, Iupiter in secunda, Mars in tertia, sol in
quarta, Venus in quinta, Mercurius in sexta, luna in
septima, item in 14, similiter in 21, Saturnus in 22,
Iupiter in 23, Mars in 24. Unde cum non sint plures horae
in illo die naturali, relinquatur ergo quod sol dominetur
in prima hora diei subsequentis a quo dicebatur dies
solis, et inde recipit appellationem. Et consimili
computatione habebimus quod luna dominatur in prima hora
diei subsequentis diem solis, et inde recipit
denominationem, et sic de aliis. Secundum hoc igitur
sagaces medici cum dant potiones vel faciunt minutiones
considerant utrum planeta benevolus vel malevolus
dominetur in hora illa. Benevoli sunt Iupiter et Venus,
malevoli Saturnus et Mars, indifferentes vero sol, luna,
et Mercurius. Unde versus:*

Iupiter atque Venus bene sunt, Sat. Marsque maligni.

²Figura ostendens distributionem et ordinem sphaerarum
coelestium aetheriae regionis.

Sol et Mercurius cum Luna sunt mediocres.

Qualitates quidem eorum complexionales in his patent
versibus:

Frigidus et siccus Satur. Iup. aestuat udus.

Mars et Sol sicci fervent, sed Luna Venusque

Udae frigescent, medius Cyllenius esto.

Humana quidem persuasio stellis numeros et nomina fecit,
non ex sui natura, sed significatione distinctionis
accommodata.

Unde Bernardus Silvestris dicit:

Communi ne voce rei generalis oberret,

Quae modo sunt stellis nomina fecit homo.

Item Virgilius in I.Geor:

Navita tum stellis numeros et nomina fecit

Pleiadas, Hyadas, claramque Lycaonis Arcton.

*Ex praedictis autem solvitur quod competens ordo est
inter planeta, quo ad circulos suos, et dies septimanae
ab illis denominantur. Ergo secundum eundem ordinem se
sequi deberent, ut statim diem sabbati sequeretur dies
Iovis, et hunc dies Martis, et sic deinceps. Ratio autem
huius est quod 24 horae distributae sunt planetis, sed*

septem sunt planetae, unde si quilibet illorum successive sibi assumat tres horas, supererunt de 24 horae tres attribuende tribus planetis. Sic igitur patet quod si aliquis dies denominetur ab uno planeta, dies sequens denominabitur a planeta tertio post.

Christiani autem, sicut Beda, Hieronymus et alii viri religiosi, istas appellationes quoniam a gentibus erant impositae volentes transmutare diem, primum septimanae diem Dominicum, sive primam feriam appellaverunt:

Dominicum quia tali die natus est dominus, tali die resurrexit, tali die mundum fecit; feriam, quia feriare idem est quod celebrare, et ab opere cessare. Et die illo, quem Dominicum appellamus, debemus cessare ab omni opere manuali, et etiam peccat. Vel Feria a ferendis victimis dicitur, quoniam olim diebus festivis ad templa ferebantur victimae et holocausta. Secundum diem septimanae secundam feriam appellabant, et sic deinceps per ordinem. Nomen vero Sabbati non mutaverunt, ut appellarent eam feriam septimam. Sabbatum enim idem sonat quod requies, et tali die requievit Dominus ab omni opere quod patrauerat, tali etiam die requievit in sepulchr. Unde adhuc tale nomen obtinuit. Iudaei autem alias habent dierum septimanae

appellationes. Primum enim diem septimanae suae vocant Sabbatum, sicut et nos, diem Dominicum primam Sabbati appellant, unde illud: Mane prima Sabbati surgens Dei filius, id est, prima die post Sabbatum. Diem vero quem nos dicimus diem lunae secundum Sabbati appellant, et ita

deinceps.

Dicitur autem dies a $\delta\iota\omicron\varsigma$, quod est clarum, vel a $\delta\upsilon\omicron$, quod est duo, quoniam dies naturalis in duo dividitur, in diem scilicet artificialem et noctem; vel dicitur dies a Diis planetae enim dii dicebantur, a quibus dies denominantur.

DE PARTIBUS TEMPORIS DIE MAIORIBUS ET PRIMO DE SEPTIMANA.

Est autem septimana septem dierum naturalium, die Dominico inchoata, successiva progressio. Et notandum quod septimanae non habent proprias appellationes quemadmodum dies, duplici ratione, cum propter earum multitudinem - sunt enim in anno 52 septimanae et unus dies - tum propter hoc, quod spacium dierum in uno anno existens una septimana est partes duarum septimarum in anno sequenti. Et ita si esset aliquod nomen appropriatum ei, esset permutandum in alio anno, quod est inconveniens, quod sic patet. Si in hoc anno sit aliquod festum in die Sabbati, idem erit in anno sequenti in die Dominico, unde illud festum quod terminat septimanam in hoc anno erit initium alterius septimanae in anno sequenti. Habent tamen septimanae communes appellationes has, scilicet, hebdomada, septimana, sabbatum. Hebdomada ab $\acute{\epsilon}\pi\tau\acute{\alpha}$ dicitur, quod est septem, et $\delta\omicron\alpha\varsigma$, quod est dies, quasi septem habens dies. Septimana dicitur a septem et mane, quasi septem habens mane, id est septem matutina tempora, et sic

sumitur pars pro toto. Sabbatum etiam dicitur septimana, per quod significatur quod per totam septimanam quiescere debemus ab opere peccati. Unde illud: *Ieunio bis in Sabbato, etc.* Ex his patet quod sabbatum est aequivocum ad totam septimanam et ad unum diem ipsius. Si autem quaeratur quare sabbatum in solennitate et hebdomadae inchoatione sicut Iudaei non autorizemus, sciendum quod solennitas Sabbati autoritate domini in diem Dominicum transivit, nam tali die natus est dominus, tali die resurrexit, tali die dona Sancti Spiritus apostolis misit. Item Iudaeis omnia sub typo contingerunt et figura. Figura autem et figuratum non idem sunt, sicut de agno vero et de agno paschali, Arca foederis et Ecclesia; patet sabbatum ergo et dies Dominicus idem esse non debent.

DE MENSIBUS.

Mensium autem, alius *solaris*, alius *lunaris*, alius *Usualis*.

Solaris est spacium temporis quandiu moratur sol in signo peragendo. Unde Philosophus: Sol unum duodecim signorum integro mense metitur. *Lunaris* est proprie post lunae a sole recessum eius ad solem reversio, de quo in sequentibus consequetur. *Usualis* est spacium dierum calendariis nostris inscriptum et ab antiquis autorizatum.

Sciendum igitur quod inter Latinos Romulus primus menses distinxit et annos, in anno suo decem menses constituens, quoniam vidit quod tantum tempus sufficit mulieri praegnanti ut pareret; vel quia per tantum tempus debuit mulier abstinere a nuptiis post mortem mariti sui.

Primum igitur mensem Martium a Marte patre suo denominavit, vel a marte, hoc est a bello: tunc enim reges Romani procedere solebant in expeditiones. Mensem secundum Aprilem ab aperiendo appellavit: tunc enim pori terrae et arborum aperiuntur, et procedunt herbae, et folia in arboribus; vel Aprilis quasi Aphrilis ab ἀφρώ, quod est spuma maris, de qua Venus nata fingitur, quae fuit principium generationis Romuli ex parte matris suae. Tertium mensem Maium a maioribus appellavit. Quartum Iunium a iunioribus. Menses vero sequentes appositis dictionibus numeralibus appellavit, ut Quintilem, Sextilem, Septembrem, Octobrem, Novembrem, Decembrem. Unde Ovidius:

Martis erat primus mensis, Venerisque secundus.

Haec generis princeps, ipsius ille pater.

Tertius a senibus, iuvenum de nomine quartus.

Quae sequitur numero turba notata suo est.

Sed postea sequens Numa Pompilius duos adiecit menses, scilicet Ianuarium et Februarium. Unde Ovidius:

*At Numa nec Ianum, nec avitas praeterit umbras,
Mensibus antiquis praeposuitque duos.*

Ianuarius dicitur a Ianua, quia quemadmodum per ianuam fit introitus in atrium, ita per Ianuarium in annum. Vel dicitur a Iano bicipite, qui deus mercatorum dicebatur. Ita enim Ianuarius duplicem habet respectum, quia ad ipsum annus terminatur et ab ipso incipitur. Februarius vero dicitur a Februo, id est, a Plutone, quia tunc solebant Romani sacrificia facere Plutoni et Diis infernalibus pro animabus antecessorum suorum. Vel dicitur a febre: tunc enim in calidis regionibus homines febricitare consueverunt. September dicitur quasi septimus ab imbre, hoc est, a tempore pluvioso, sicut a Februario. Similiter est de aliis.

Licet igitur Numa annum ex duodecim mensibus fecerit, diminute tamen egit, quoniam menses assumpsit lunares, unum scilicet 30 dierum et alium 29 dierum. Unde annus eius constabat ex .354. diebus, qui numerus dies non sufficit cursui solis. Sequens igitur Iulius Caesar ultimam Calendario apponens correctionem undecim dies adiecit et quadrantem. Unde annus Iulii constabat ex 365 diebus et sex horis. Superflue tamen partem duodecimam unius horae assumpsit, ut inferius patebit. Calendarium etiam a Martio iussit inchoari. Unde Ovidius:

Qui Ianum sequitur veteris fuit ultimus anni,

Tu quoque sacrorum Termine finis eras.

Et dies anni inter menses numero competenti distribuit, ita quod mensibus imparibus dies 31, mensibus vero paribus 30 attribuerentur. Sed cum ad ultimum mensem imparitatis Ianuarium scilicet pervenisset, defuit unus die. Unde a Februario subtraxit unum diem ad completionem numeri dierum Ianuarii, quem recuperaret Februarius in anno bisextili. *Tempore autem Iulii Caesaris, Romani adulantes Iulio mensem prius dictum Quintilem Iulium appellaverunt, quia in tali tempore dicitur fuisse natus. Similiter tempore Augusti, mensem prius dictum Sextilem Augustum appellaverunt.* Sed tunc invidens Augustus mensem suum mense Iulii breviorum esse, diem unum a Februario surrupuit et Augusto addidi. Unde remansit Februarius 28 dierum. Aliud insuper accidit inconveniens tres menses simul esse 31 dierum, Iulium scilicet, Augustum et Septembrem. Unum igitur diem removens a Septembri eum Octobri attribuit; similiter unum a Novembri quem Decembri addidit. Hac itaque mensium ordinatione et numeri dierum positione, licet reprehensibilis fuerit, usque hodie utitur Ecclesia.

Per quam autem literam quilibet *mensis incipiat*, et in qua per consequens terminetur, in his patet versibus:

*Altitonans, Dominus, divina, gerens, bonus, extat,
Gratuito coeli fert aureo dona fideli.*

Primae enim literae harum duodecim dictionum ostendunt
literas inchoativas mensium, habito initio a Ianuario.
Qui autem menses usuales plures habeant dies et qui
pauciores, scitur in his versibus:

*Sep.No.Iun.Ap. triginta dato, reliquis magis uno.
Ni sit bissextus Februus minor est duobus.*

In quolibet quidem mense dicitur sol intrare novum
signum, et ut notabilius dicatur circa medium mensis,
prout praesens sensui subiicit figura.³

Est autem signum certa zodiaci portio duodecima ab
astronomis distincta. Gradus autem est tricesima signi
portio. Nomina igitur signorum ordinatio et numerus in
his patent versibus:

*Sunt Aries, Taurus, Gemini, Cancer, Leo, Virgo.
Libraque, Scorpius, Architenens, Caper, Amphora,
Pisces.*

Unde si in quo gradu cuiuslibet signi sit sol scire
volueris, numero dierum mensis praeteritorum adde 15, et
si resultent 30 vel minor numerus, in tali gradu signi ad
mensem pertinentis est sol; si vero maior abiiciantur 30
pro signo mensis, et quot fuerint in residuo, in eo gradu

³Figura: in quolibet quidem mense dicitur sol intrare
novum signum.

signi sequentis est sol: nam signum detur mensi quem fine meretur. Quod autem signum cui mensi pertineat in his patet versibus:

Ap, Aries. Ma, Tau. Iu, Ge. Iul, Can. Au, Leo. Sep, vir.

Octo, Libra. No, Scor. De, Sa. Ian, Capricor. Feb, A. Mar, Pis.

Haec tamen regula non penitus penes ordinationem mensium quae nunc est, sed quae esset deberet attendatur.

Aries.

Primum igitur signum est Aries, quoniam secundum quod credit Ecclesia, in eo factus est sol, licet dicant Arabes quod factus sit in Leone. Et dicitur Aries, quoniam quemadmodum Aries est animal quod in parte anteriore viget, in posteriori vero debile est, ita sol existens in illa parte zodiaci quae Aries dicitur in tempore hyemali parum habet virtutis, scilicet caloris et siccitatis, in parte anteriori magis, scilicet versus aestatem. Vel ut dicitur, Aries tota hyeme sinistro lateri accumbit, aestate vero dextro, siquidem sol tota hyeme accedit ad inferius hemisphaerium, aestate vero ad superius, quod est, quasi latus mundi dextrum.

Taurus.

Secundum signum Taurus dicitur, quia tunc labores Taurorum sive bovuum apparent; vel quia sicut Taurus est animal fortius Ariete, ita sol in eo signo existens fortior est in virtutibus suis, vel qualitatibus, quam fuit in Ariete.

Gemini.

Tertium signum est Gemini, quoniam tunc geminatur virtus solis in caliditate et siccitate; vel quia sicut Gemini depinguntur iuvenes amplectentes se, ita quando sol est in illa parte coeli quaedam terrae nascentia amplectuntur se et pubescunt per radicem superius in herbam.

Cancer.

Quartum signum Cancer dicitur. Sicut enim Cancer est animal retrogradum, ita sol existens in illa parte zodiaci a nostro recedit hemisphaerio; unde signum illud dicitur tropicum, quasi conversivum. In eo enim fit solstitium aestivale.

Leo.

Quintum signum Leo dicitur, quia sicut Leo est animal ardentissimae naturae et implacabilis irae, ita sol existens in illa parte coeli ardentissimus est et siccissimus. Unde tunc non est bonum minui nec

purgationibus uti, propter defectum humoris in tempore caloris et siccitatis, sicut innuit Hippocrates: sub cane et ante canem sunt molestae purgationes. Sunt enim tunc dies Caniculares, quorum initium et terminus sic habentur:

*Iulius a Nonis inducit Caniculares,
Septembris gaudent deca sexto fine Calendas.*

Virgo.

Sextum signum est Virgo. Sicut enim Virgo sterilis est, et nihil in esse producit, ita tempus illud dum sol est in Virgine sterile est et nihil producit, sed producta maturat.

Libra.

Septimum signum est Libra, quoniam tunc librantur dies artificialis et nox, et est aequinoctium Autumnale.

Scorpio.

Octavum signum Scorpio dicitur. Sicut enim Scorpius cum cauda pungit, ita matutina parum cautos tunc frigora laedunt.

Sagittarius.

Nonum signum dicitur Sagittarius. Tunc enim in nos mittuntur sagittae temporis, tempestates scilicet, imbres, grandines et huiusmodi.

Capricornus.

Decimum vero signum Capricornus dicitur, quia quemadmodum Caper in pascendo erigit se, ita sol tunc ab inferiori hemisphaerio versus nostrum hemisphaerium ascendit. Unde hoc signum tropicum quasi conversivum dicitur. Est enim tunc solstitium hyemale, et de caetero sol convertitur ad nos.

Aquarius, Pisces.

Residua duo signa, scilicet Aquarius et Pisces, abundantiam aquarum notant. Dicitur enim Aquarius ab aquosa qualitate aeris, Pisces vero quia in pluviis omnia natare videntur. Quidam tamen dicunt quod haec signa a situ stellarum in illis partibus ad modum huiusmodi animalium sic denominantur. Unde Macrobius:

Sydera in signum plurium stellarum compositione formantur.

Et Lucanus de Ariete dicit:

Sed postquam vernus calidam Titana recepit

Sydera respiciens delapsa portitor Helles.

Qualitates autem omnium signorum. per quatuor triplicates distinctorum in his versibus patent:

Ignea sunt a, leoque, sa. Terrea tau, caper, et vir.
Uda, ge, li. et a, fervent. Cancer, aquatica, Scor,
pis.

QUID CALENDAE, NONAE ET IDUS.

Notandum etiam quod in quolibet mense sunt tres dies denominationes fortiti principales, a quibus assumptis dictionibus numeralibus omnes caeteri dies denominantur, scilicet *Calendae, Nonae et Idus*. Dicuntur autem *Calendae* quasi *colendae*. Primus enim dies cuiuslibet mensis colebatur ab antiquis in honore Iunonis. Unde Ovidius:

Vendicat Ausonias Iunonis cura Calendas.

Vel dicuntur *Calendae* a $\kappa\alpha\lambda\omega$ quod est *voco*. Preco enim primo die cuiuslibet mensis ascendebat locum eminentem in civitate, et clamabat quater $\kappa\alpha\lambda\omega$ vel pluries, secundum quod *nundinae* per plures in mense sequenti durarent dies, et ideo in plurali numero dicuntur *Calendae*. Vel dicuntur *Calendae* a $\kappa\alpha\lambda\acute{o}\nu$, quod est *bonum*, eo quod in primo cuiuslibet mensis die solebant ab amicis mutuo dari quaedam dona, ut per totum mensem sequentem bonum omen

eis eveniret. Nonae dicuntur a non nullus enim Deus habuit festum in Nonis. Unde Ovid:

Nonarum tutela Deo caret, etc.

Vel dicuntur Nonae quasi novae, propter statuta renovata in singulis mensibus apud Romanos. Vel dicuntur nonae a nundinis; per tot enim dies durare solebant quot erant nonae. Idus vero dicuntur quasi divisiones: dividunt enim mensem fere in duas partes aequales; vel quia tunc dividebantur nundinae.

Ab istis autem diebus coassumptis dictionibus numeralibus denominantur alii dies mensis, ita quod maiori numero secundum quod magis antecedunt, minori secundum quod minus. Si igitur quaeratur quare non dicatur secundo Calendas, Nonas, et Idus, dicendum quod haec dictio secundus provenit a verbo sequor, unde sequi deberet dies ille, si recte diceretur secundus; sed ibi bene dicitur pridie Calendas, id est, priori die ante Calendas. Quilibet autem mensis octo habet Idus. Unde versus:

Octo tenent Idus menses generaliter omnes.

Sed quidam menses plures habent nonas, quidam pauciores habent Nonas. Unde versus:

Mar. Ma. Iul. Oc. senas, reliquis dato duo bis duo

nonas.

Habito igitur quot dies habeat quilibet mensis, sicut ex praedictis patet, et quot Nonas et Idus, subtractis Nonis et Idibus reliqui omnes erunt Calendae.

Notandum etiam quod in quolibet mense sunt duo dies qui dicuntur aegri, mali, et aegyptiaci. Aegri ab effectu: secundum enim opinionem quorundam, si quis his aegrotaret diebus vix vel nunquam evaderet. Mali, quia malum erat incipere aliquod opus in his diebus propter malas eorum constellationes. Aegyptiaci, quia ab Aegyptiis erant inventi. Praeter enim decem plagas notas quae in his breviter habentur versiculis:

Sanguis, rana, culex, muscae, moriens pecus, ulcus.

Grando, locustae, nox, mors prius orta necans,

Contingerunt eis plurima mala ita quod bis in mense quolibet, sicut in Calendario notatur. Quidam etiam in his diebus humanum sanguinem Plutoni sacrificabant, unde prohibitum est ne quis in his diebus sibi minuat, ne videatur sacrificare daemoni. Observationes tamen istorum dierum inhibet Augustinus, dicens:

Calendas mensium, et dies aegyptiacos non observetis

*sed quia a vulgo sunt suspecti, ad illos habendum
sciantur isti quatuor versus:*

Armīs Gunfe, dei Kalatos, adamare dabatur,
Lixa memor, conflans gelidos, linfancia quosdam,
Omīne limen, Aaron bagis, concordia laudat,
Chiiae linkat, ei coequarta, gearcha lifardus.

Istorum versuum singulae binae dictiones singulis
serviunt mensibus, initio sumpto a Ianuario. Si igitur
primum diem aegyptiacum alicuius mensis habere volueris,
computentur tot dies a principio mensis illius
descendendo quota est litera prima praecedentis dictionis
in alphabeto, et ubi terminatur talis computatio ibi est
dies aegyptiacus, et quota fuerit prima litera secundae
syllabae eiusdem dictionis in alphabeto, talis hora
illius diei est suspecta. Ad habendum autem secundum diem
aegyptiacum eiusdem mensis, computentur tot dies a fine
mensis ascendendo quota est prima litera sequentis
dictionis in alphabeto, et quota fuerit prima litera
secundae syllabae eiusdem dictionis in alphabeto, talis
hora eiusdem diei est suspecta, *hoc etiam praenotato,
quod H non computatur pro litera.*

DE ANNIS

Annorum autem alius planetarum singulorum discretus,
alius omnium communis, qui annus mundi, sive perfectus

nuncupatur.

Discretus est spacium temporis quo quilibet planetarum zodiacum complete peragrat. Est autem zodiacus firmamenti cingulus planetarum via, stellis fixis signorum distinctio. Unde Saturnus omnium planetarum supremus signiferum 30 annorum spacio peragit. Deinde Iovis sydus temperatum annis .12. ipsum complet. Mars vero tertius annis duobus circuit. Medius autem omnium planetarum sol 365 diebus et quadrante zodiacum percurrit. Infra solem Venus est, quae et Lucifer et Vesper dicitur, temporibus tamen diversis. Illi quidem Mercurius proximus est, qui modo ante solis ortum, modo post eius splendescit occasum, qui duo pari temporis spatio minime minus sole signiferum circumeunt. Horum enim trium ordinem motus vicinitas confundit. Luna vero omnium novissima 27 diebus et tertia parte diei per signiferum confugit, deinde biduo in solis commorata coniunctione, nusquam in firmamento apparet, ultra cuius regionem nihil temporis subiacens immutationi transcendit. Est enim sex superiorum, puritas vero inferiorum, divinorum caducorumque medium interstitium. Unde Claudianus:

Lunari subiecta globo qui septimas auras
Ambit, et aeternis mortalia separat astris.

Magnus autem annus est spacium temporis in quo planetae omnes simul cum stellis fixis firmamenti universis ad loca quae in prima origine mundi tenuerunt revertuntur;

de quo Iosephus sic meminit:

Nullus ad vitam modernam et annorum nostrorum
brevitatem vitam comparans antiquorum, falsa putet
eorum scripta, quae nunc haud ediscere posset, si
sexcentos viveret annos.

In tot enim annorum circulis magnus completur annus. Sed
philosophorum verior existit sententia qui magnum annum
15000 annorum summa definiunt, qui est annus totius
mundi. Unde versus:

Millia ter quinque mundus complectitur annos,
Ut Plato testatur, quos magnum nuncupat annum.
Ex his bis centum, minus uno millia quinque.
Praecessere tuae nova legis tempora Christe.

Veruntamen annus mundi perfectus 36000 solis revolutiones
ex eiusdem ratione subsultantibus continere videtur.

DE ANNO SOLARI.

Cum itaque *multiplex* sit *annus*, et caeteris omnibus
omissis duo specialiter a computista intendantur,
scilicet *solaris et lunaris*, de digniori prius est
pertractandum, scilicet de solari. Est igitur *annus*
solaris spacium temporis quo *sol* a quocunque quatuor
punctorum *zodiaci* aequalitatis vel conversionis movetur,

circumiens totum zodiacum motu proprio, rediens iterum ad idem punctum. Unde apud antiquos solet depingi serpens devorans propriam caudam sic:

Serpens annus ego sum, Sol sic circinat in quo,
Qui fluxit pridem, status est nunc temporis idem.⁴

Cuius quidem revolutionis terminus in 365 diebus et quarta diei naturalis praeter rem modicam secundum sensum perficitur. Neque defectus illius quantitatem secundum veritatem propter diversitatis parvitatem possibile est inveniri, sicut in Almagesti dictione tertia a Ptolemeo reperitur. Hoc etiam sciolis computistarum suae licet professioni adversantibus sensibiliter ex eius causa congruit demonstrari. Est itaque solis motus in die uno naturali 59 minuta, 8 secunda, 17 tertia, 13 quarta, 12 quinta et 31 in sextis, ut huiusmodi quippe minorum in fractionibus ad sexta perveniat nunc sufficit partitio. Qui quidem motus si zodiacum in sexta redactum, tum in toto tum in parte prout competit mensuret, praedictis 6 horis non ex toto unius duodecima deficiet. Unde versus:

Qui scidet Eudoxum superatur Caesari annus.

Haec itaque anni solaris quantitatis si per 12 dividatur

⁴Figura: serpens annus ego sum, sol sic circinat in quo.

erit mensis solaris 30 dierum et 10 horarum et 29
minutorum et 36 secundorum. *Dicitur autem annus ab
innovatione cunctorum vegetabilium, quae temporum
vicissitudine naturaliter praeterierunt; vel ab an quod
est circum et eo, is, propter praedictam temporis
revolutionem.*

*Notandum igitur quod secundum diversos diversa sunt anni
principia. Numa enim Pompilius annum suum incepit a
solstitio hyemali, quoniam tunc ad nos sol ascendere
incipit. Unde Ovidius:*

*Bruma novi prima est, veterisque novissima solis.
Principium capiunt Phoebus et annus idem.*

*Romulus vero annum incepit a Martio, iuxta aequinoctium
Vernale, quia tunc omnia virent et florent. Secundum
theologiam autem annus a Martio digne inchoari videtur,
cum mundus factus sit 15 Calendas Aprilis. Item
praecepto Domini in Exodi.12 de Martio dicentis: Mensis
iste primus erit in mensibus anni. Unde versus:*

*Omnia cum vireant tunc est nova temporis aetas.
Sic annus per ver incipiendus erit.*

*Arabes vero annum incipiunt a solstitio aestivali, quorum
opinio est sol factum fuisse in Leone. Quidam autem annum
incipiunt a Septembri, iuxta aequinoctium autumnale,*

quemadmodum Iudaei, propter illud Genesis: Protulit terra herbam virentem, facientem fructum iuxta genus suum. Sed autumnus est tempus fructuosum, unde ibi volunt annum incipere cum a fructibus suis annum veterem spoliaverunt. Istorum autem omnia principia imitamus in aliquibus et in aliquibus mutamus. Nam claves terminorum, aureum numerum et litteram Dominicalem incipimus a Ianuario, concurrentes et regulares solares a Martio, a Septembri vero Epactas et regulares lunares, et secundum quosdam embolismos. Unde versus:

Aureus in Iano numerus, clavesque novantur,
Littera sic Domini nova, et bissextus eandem.
Mars concurrentem renovat, September epactas.

DE MUTATIONE FERIARUM IN SINGULIS ANNIS ET SINGULIS
MENSIBUS ANNORUM.

Sunt quidem in anno 52 septimanae et unus dies et quarta fere diei, prout in praedictis innuitur. Dies igitur iste residuus variat septimanas, et est causa quare festa Sanctorum et littera dominicalis singulis annis variantur, et quod Calendarium in A. incipit, est origo concurrentium. Sed cum nullus dies sit extra septimanam, dies iste pars erit septimanae sequentis, et sic anni initium. Unde per septimanas computando integras, in tot diebus fit anni anticipatio quotus est concurrentis. Sic igitur annus cycli ultimus 53 continet septimanas. Quod

autem festa Sanctorum per istum diem varientur, sic patet: si festum aliquod in hoc anno fuerit in die Dominico, in anno sequenti idem erit in die lunae, et si bisextus fuerit, in die Martis. Haec eadem variatio est per singulorum mensium Calendas. Unde ad habendum generaliter et artificiose quota feria quilibet mensis incipiat, inventi sunt duo numeri, concurrrens scilicet et regularis solaris.

EST AUTEM CONCURRENS numerus, septenarium non excedens, proveniens ex super abundantia anni divisi per septimanas. Numerus dico large, ut unitas numerus appelletur, quoniam quandoque unitas est concurrrens. Non excedens septenarium dico, quia concurrrens septem non transit, sed petit assem. Cum enim septem sint feriae tantum in septimana, et concurrrens cum regulari habeat ostendere primam feriam mensis, neuter eorum excedet septenarium. Proveniens ex superabundantia dico, quoniam ille dies qui relinquitur ultra septimanas in anno est causa concurrentis.

Primus igitur annus cycli solaris unitatem habet pro concurrente, secundus binarium, tertius ternarium, quartus, quinarium, uno die superaddito propter bisextum, quintus senarium, sextus septenarium, septimus unitatem, octavus ternarium propter bisextum. Et eodem modo computandum est donec perveniatur ad 28 annum, ubi septenarius est concurrrens, et est annus bisextilis.

Postea vero redibit penitus idem status in formatione concurrentium, unde et spacium 28 annorum dicitur cyclus concurrentium. Per hos autem versus scitur quis numerus sit concurrens in quolibet anno Cycli:

*Quam feriam Martis F. littera significabit,
Illius in numero concurrens serviet anno.*

Vide enim quota feria significetur per primum F. in Martio, et talis est concurrens illius anni. Vel sic:

*Sex habet A, B quinque tenet, C quatuor, et D
Tres habet, E que duas, F unum, G quoque septem.*

Quoties enim A est littera dominicalis, senarius est concurrens, quoties B quinquarius, et ita deinceps. Dicitur autem concurrens a con, quod est simul, et currere, quoniam simul currit cum regulari ad ostendendum quota feria quilibet mensis incipit.

REGULARIS solaris est numerus septenarium non excedens qui adiunctus concurrenti primas ferias mensium indicat. Numerus dico, ut prius. Non excedens septem dico, ut prius. Sed istud membrum, qui adiunctus etc., ostendit tam officium concurrenti quam regularis. Habet autem nunc et semper habebit quilibet mensis tot pro regulari quota feria incepit principio mundi. Mundus autem factus est 15 Calendas Aprileis, unde ibi solet notari primus dies

saeculi, et sol in Ariete. Unde versus:

Principium mundi renovat G. tertia Martis.

*Constat quidem quod primus dies saeculi fuerit dies
Dominicus. Illa igitur G fuit litera dominicalis.*

*Supposito itaque per totum annum sequentem quod G sit
litera dominicalis, patet qua feria mensis incipiant, et
sic per consequens patent regulares. Habet autem Martius
quinarium pro regulari, tanquam habuisset omnes dies suos
integraliter. Vel regularis Martii provenit ex numero 4
dierum remanentium ultra divisionem dierum anni intra
singulos menses per 30 factam. Habito igitur uno
regulari, scilicet Martii, sic per artem formari possunt
omnes aliorum mensium regulares. Numero dierum Martii
iunge eius regularem, et ab illis simul iunctis
subtrahatur septenarius quoties poterit, et remanebit
unitas, quae est regularis Aprilis; et similiter
faciendum est de omnibus aliis mensibus; hoc etiam
praenotato, quod si nihil sit residuum, septenarius erit
regularis mensis subsequens. Per hos autem versus sine
labore possunt haberi omnium mensium regulares:*

Quinque No. Mar, Iu. Fe. Sex, A. Iul. assem, Sep,

Deque septem,

Oc. duo, Ma. Iaque tres habet, Au. duo bis regulares.

Habitis igitur concurrente et regulari, insimul

iunguntur, et si ex eorum coniunctione resultet septenarius vel minor numerus, a tali feria incipit mensis cuius regularem sumpsisti; si autem maior, reice septem, et quotus erit numerus residuus, a tali feria incipit mensis cuius regularis sumebatur. Unde versus:

Dant feriam mensis concurrens et regularis.

Cum plus sit septem, reliquum cape, reice septem.

Dicitur autem regularis quia regulariter cum concurrente primam feriam mensis ostendit. Et dicitur solaris ad differentiam regularis lunaris.

DE ANNO BISEXTILI.

Sex autem horarum diem bisextilem integrantium nunc restat assignatio. Est autem bisextus in Februarium quarto anno cycli solaris (ut cursui solis tempus adaequetur) diei unius interposito. Sunt enim in anno solari 365 dies et 6 horarum fere integritas, prout in praedictis manifestatur, gratia tamen confusionis vitandae complete supponuntur. Quoniam igitur *difficile esset has 6 horas cuilibet anno continuare, ita quod nunquam in diem redactae, alicubi ponerentur.* Nam *secundum hoc, si annus praecedens incipiat a mane, secundus a meridie, tertius a vespere, quartus a media nocte inciperet. Quare provisum est quod sex horae excedentes in primo anno, et sex in secundo, et sex in*

tertio, reserventur ad sex horas quarti anni, unde sic in anno quarto dies unus, ex quater sex horis colligitur. Iste igitur dies ita particulariter collectus interponitur in Februario, quoniam mensium brevissimus est, et secundum rationes praedictas, ultimus. Et quoniam quando est annus bisextilis in Ecclesiis Cathedralibus legentes in Martylogio bis pronunciant sexto Calendas Martii, duos dies ponentes super eandem literam, ideo bisextus dicitur. Duo igitur dies cum super eandem literam F. computentur, in sequenti die debet celebrari festum beati Mathie apostoli. Unde versus:

Bisextum sextae Martis tenuere Calendae,
Posteriori die celebrantur festa Mathiae.

Ratio autem quare in eo loco intercaletur bisextus est haec: senarius est primus numerus perfectus, et illo die est quasi perfectio anni. Unde interponitur die denominato a numero perfecto, et non in ultimo, ne festum termini mobilitaretur. Numerus autem perfectus est cuius partes aliquotae simul aggregatae ipsum numerum praecise perficiunt. Et hac ratione dici potest quod in Februarium interponitur, cum dies eius in secundo numero perfecto consistant. Utrum autem annus sit bisextilis nec ne sic scitur: numerus annorum Domini ab eius nativitate inceptorum per 4 dividatur, et si non residuum praesens annus est bisextilis, si autem residuum sive 1 sive 2 sive 3, ostendit annum post bisextum. Unde versus:

*Tunc bissextus erit, partes per quatuor aequas
Annos partiri cum poteris Domini.*

*Notandum est etiam quod nisi bissextus observaretur, in
364 annis contingeret natale Domini in tam longis diebus
celebrari sicut nunc celebratur Annunciatio Domini, quod
sic patet: in tot annis, cum quartus sit semper
bisextilis, contingunt 91 dies, qui numerus est quarta
pars 364 dierum. Sed ex 91 diebus possunt perfici tres
menses, duo scilicet 30 dierum et unus 31 dierum. Et isti
tres menses sunt quarta pars anni, quae si esset
subtracta, contingeret praedictum inconueniens, vel forte
peius, scilicet quod natale Domini celebraretur ubi nunc
celebratur festum Ioannis Baptistae, quod patet
consideranti si duplentur anni.*

DE CYCLO SOLARI ET INVENIENDA LITERA DOMINICALI.

*Viso quid sit concurrentes, quid bissextus, sequitur de
cyclo solari, quae est quasi istorum annorum effectus. Est
igitur cyclus solaris reuolutio temporis in qua
considerantur omnes variationes quae fiunt in anno solari
per concurrentem et bissextum. Et completur ille cyclus
quando ultra septimanas integras nihil est residuum de
diebus excrescentibus ultra annum hebdomaticum, qui sunt
causa concurrentium, nec de horis excrescentibus singulis
annis ultra dies anni, ex quibus provenit bissextus. Et
illud spacium est 28 annorum, quoniam in tanto tempore*

*complentur omnes istae variationes, et quodlibet festum per quamlibet feriam variatur, et bisextus in qualibet feria contingit, et ita in toto cyclo ex diebus bisextilibus integratur una septimana, sicut patet depingenti cyclum solarem et tabulam concurrentium.*⁵

Cum autem cyclus sit circulus, et in circulo contingat ubicunque volueris principium assignare, non est mirandum si cyclus solaris secundum diversos diversa habeat principia. Discretio igitur cycli solaris secundum veritatem et utilitatum considerationem in his habetur versibus:

Fons est dans bis agro, fundus cibet, aufer edacem.

Augens fert escas, bos aut gens, edacibus glans.

Istorum versuum singulae syllabae singulis annis cycli solaris per ordinem deserviunt, prima primo secunda secundo, et ita deinceps. Prima igitur utilitas horum versuum est ut sciatur litera dominicalis, quae enim litera est inchoativa syllabae, dominicalis erit per totum annum cui deservit illa syllaba, nisi bisextus fuerit. Si autem fuerit bisextus, litera illa dominicalis erit per decem menses, sumpto initio a Martio, et litera quae signatur extra fuit litera dominicalis per Ianuarium et Februarium usque ad locum bisexti. Secunda utilitas est ut sciatur quod habita litera dominicali, statim per

⁵Figura: cyclus solaris.

hunc versum habetur concurrens:

F.E.D.C.B.A.G. concurrentes posuere.

Quoties enim F. est litera dominicalis, unitas est concurrens, quoties E. binarius, et ita de aliis, observato ordine literarum positarum in versu. Tertia utilitas est ut sciatur utrum annus sit bisextilis necne. Sumantur igitur in septem digitis duarum manuum ita quod primus annus cycli sit in radice indicis sinistrae manus, secundus in iunctura proxima, tertius in superiori, quartus in summitate indicis, quintus in radice maioris digiti, et ita ascendendo, donec compleatur cyclus. Dico igitur quod in septem summitatibus sunt septem anni bisextiles, in radicibus vero primi anni post bisextum, et sic deinceps. Hoc etiam scitur per tale abecedarium retrogradum: G.F.E.D.C.B.A. Quoties enim in supradictis versibus transilitur aliqua litera istius abecedarii, tunc est annus bisextilis, et litera pertransita erit litera dominicalis per duos menses, sicut praedictum est. Litera vero prima syllabae sequentis ubi factus est transitus erit litera dominicalis per decem menses. Literae itaque bisextiles in septem annis bisextilibus ex quibus in toto Cyclo una colligitur septimana in hoc habentur versu:

Constans est genitor, bona donat, fertilis autor.

Cyclus vero solaris secundum Dionysium non incipit ab eo anno quem nos cum Garlando constituimus principium, sed a duodecimo illius, ubi F. est litera dominicalis et unitas concurrens, quemadmodum in primo anno, sed est annus bisextilis, cuius quidem descriptio his versibus continetur:

Fallitur Eva dolo, cibus Adae gaudia finit

Et cum botrus adhuc germinet, Eva dolet.

Christus bella gerit, finitur eo duce bellum,

Ad gravidum fit dux, cuncta beavit Ave.

Eadem est ars in istis quae in superioribus, sed hic per dictiones, ibi per syllabas; et habent initium a summitate indicis, per annum bisextilem, discurrendo per summitates et iuncturas digitorum, ut prius. Et prima litera dictionis, dominicalis erit, ut prius.

Hoc autem artificio scire possumus in quoto anno cycli sumus quoad eius ordinationem naturalem et usum Ecclesiae: addantur annis domini 20, nam Vigeno primo Christus natus fuit anno, et tota summa per 28 annos dividatur. Facta igitur divisione, si nihil est residuum, sumus in ultimo anno Cycli, si autem est residuum, ostendit nobis in quoto anno simus. Sed si in quoto anno cycli secundum Dionysium simus scire volueris, annis Domini addantur novem:

*Nam decimus solis, Christo nato fuit annus
Errans, in cyclus fert ut Dionysius Abbas.*

Et totum per 28 divide, ut prius, et patebit quaesitum.

DE QUATUOR TEMPORIBUS ANNI, NEMPE VERE, AESTATE, AUTUMNO
ET HYEME, ET DE IEIUNIIS.

Cum autem generalis temporis permutatio praecipue a sole fiat, cuius appropinquatio calefacit, mora vero vicinitatis desiccat, remotio quidem infrigidat, sed mora remotionis humectat, secundum eius approximationem, elongationem, vel mediocrem quoad nos consistentiam, quatuor distinguuntur anni tempora, scilicet ver, aestas, autumnus et hyems.

Est enim tempus anni in quacunque quatuor quadrarum zodiaci, puncto vel solstitiali vel aequinoctii inchoata, solis peragratio. *Ver* autem dicitur a *vireo*, vires, quia tunc omnia virent et florent. *Aestas* dicitur ab aestu, id est, fervore. *Autumnus* dicitur a bonorum anni augmentatione, vel ab *autumus*, quod est idem, quod *morbidum vel tempestuosum*; est enim tempus frigidum et siccum. *Hyems* dicitur a $\eta\mu\iota$, quod est dimidium: vulgus enim dividit annum in *hyemem* et *aestatem*, large appellans *hyemem* anni medietatem. Istorum quidem quatuor anni temporum qualitatibus, quatuor mundi regiones, quatuor venti cardinales, quatuor elementa, quatuor corporis

humores et quatuor hominis aetates complexionem
convertuntur, prout in subiecta clarescit figura.⁶

De naturis autem reliquorum ventorum iudicabis ex
cognitione quam habent cum ventis cardinalibus cognatio
autem sequentibus patet versibus:

Euro Vulturnus, Subsolanusque sodales,
Aphricus atque Notus Austro sunt collaterales.
Et Zephyrum, Corus, Favonius atque sequuntur.
Circius ac Aquilo Boream stipare feruntur.

*Principia vero et terminationes quatuor anni temporum quo
ad Ecclesiam in his habentur versibus:*

Ver Petro detur, Aestas exinde sequetur.
Hanc dabit Urbanus, Autumnum Symphorianus,
Festum Clementis hyemis caput est orientis.

Secundum astronomos vero per quatuor quadras zodiaci
ista distinguuntur tempora. Unde versus:

Zodiaci caput est Aries, et veris et anni,
Aestatis cancer, autumnus pendula libra.
Incipit ex imo pluvialis hyems Capricorno.

Sed in quibus mensibus et quoto die mensis initium

⁶Figura: quatuor anni temporum, etc.

habeant sic patet:

Martius a medio Ver ducit, Iunius Aestum.

Autumnus September habet, Brumamque December.

Habet autem tam aestas quam autumnus 91 dies, hyems vero 92 propter diem imparitatis ultra septimanas in fine Decembris assignatum. Ver quidem habebit 91 dies si bisextus fuerit, sin autem non 91 dies, quemadmodum aestas et autumnus. In praedictis autem versibus si non assignantur cuilibet parti tot dies quot assignando iam diximus, hoc ideo contingit quoniam principia et terminationes praedictarum anni partium per festa notibilia volunt notificari, et circa eorum principia non sunt festa magis notabilia. Non igitur fiat vis in hoc, si unus vel duo dies unius partis computentur cum diebus alterius partis.

In his quatuor temporibus sive anni partibus sunt duo solstitia et duo Aequinoctia. Dicitur solstitium non quia sol aliquando stet, sed quia tunc est in maximo accessu ad zenith capitis nostri, vel iterum in maxime recessu a zenith capitis nostri. Zenith autem punctus quidam est firmamenti capitibus nostris directe suprapositus. Aequinoctium vero dicitur quando dies artificialis nocti adaequatur. In quibus igitur signis contingant solstitia et aequinoctia patet in his versibus:

Haec duo solstitia faciunt Cancer, Capricornus.

Sed noctes aequant Aries et Libra diebus.

Est itaque solstitium hyemale circa principium et introitum solis in Capricornum, scilicet in medio Decembri: tunc enim sol maxime recedit a zenith capitis nostri, sive a nostro habitabili. Solstitium vero aestivale est circa principium Cancrī in medio Iunii: sol enim tunc maxime accedit ad nostrum zenith in nostro habitabili. Cum autem sol recedens a primo puncto Capricorni venit ad locum medium inter utrumque solstitiorum facit aequinoctium circa medium Martii, in principio Arietis. Et quoniam contingit in vere, dicitur aequinoctium vernale. Sol vero discedens a Cancro versus Capricornum venit ad locum medium inter utrumque, et tunc facit aequinoctium. Et quia contingit in autumnō, dicitur aequinoctium autumnale, in medio Septembris, scilicet circa introitum solis in Libram.

De certis quidem diebus solstitiorum et aequinoctiorum dubium est apud modernos. Dixerunt enim veteres quod sol intrat novum signum 15 Calendas alicuius mensis. Unde versus:

Semper quindenis ponuntur signa Calendis,

Et octavo die post dixerunt esse solstitium vel aequinoctium. Unde patet cum sol intret Capricornum 15

Calendas Ianuarii, et octavo die post debet esse solstitium, erit solstitium hyemale in die nativitatis Domini, scilicet 8 calendas Ianuarii. Similiter cum sol intrat Cancrum 15 calendas Iulii erit solstitium aestivale in die nativitatis beati Ioannis Baptistae. Similiter est de aequinoctiis: quoniam cum sol intret Arietem 15 Calendas Aprilis erit aequinoctium vernale, ubi notatur annunciatio Domini, scilicet 8 Calendas Aprilis. Cum sol iterum entrat Libram 15 calendas Octobris erit aequinoctium autumnale, in die conceptionis Iohannis Baptistae, scilicet 8 Calendas Octobris. Sed quod solstitium hyemale fuerit in die sexto tempore nativitatis Domini ante eius ortum, aestivale sexto die ante nativitatem beati Iohannis Baptistae, ostendi per hoc videtur quod cursui solis plus temporis quam debeat attribuitur. Unde et retrocedunt solstitia et aequinoctia, quantum enim ad veritatis sensibilitatem sol moratur in quolibet signorum per 30 dies et 10 horas et 29 minuta et 36 secunda, licet 30 minuta minus complete una medietas horae unius supponantur, prout in praedictis sensibilitur exprimitur. Unde una centesima et quinquagesima pars unius horae, scilicet 24 secunda, in omni superflue computantur signa. Et cum 12 sint signa, erunt duodecies 24 secunda, ex quibus in unum redactis pars horae duodecima conficitur. Sic igitur in 12 annis hora una integrabitur. Unde cum dies naturalis ex 24 horis constet, in duodecies 24 annis, hoc est in 288 annis, dies unus naturalis superfluere reperietur. Nunc

igitur cum in die 10 solstitium hyemale nativitatem Domini die nativitatis computato, aestivale Beati Ioannis Baptistae antecedit (quod diversis lucescit rationibus), et non nisi quater praedictus numerus ab annis Domini subtrahi possit, reliquitur quod tempore nativitatis Domini et beati Ioannis in sexto die praecesserit solstitium, et sic nunc est in decimo. Idem etiam respectu annunciationis Dominicae et conceptionis Ioannis Baptistae de aequinoctiis invenitur. *Unde versus:*

Solstitium decimo Christum praeit atque Ioannem.

Nuncia sic matris nox aequa, diemque Ioannis.

Solstitiorum autem et aequinoctiorum retrocessionis error Calendario ordini restitui saltem in die vitabitur, si in postremo temporis istius anno, scilicet 288 annorum, in fine Februarii dies unus surripiatur, vel decentius diei bisextilis praetermittatur appositio qui ex divisione annorum Domini per numerum praedictum cum nihil remanserit percipietur. Haec etiam eadem lunae primationem per plurima saeculorum spatia itidem in die stabiliret subtractio. Unde et hic ex huiusmodi diei subtractione annus decurtationis sive ex temporum aequationis iucunditate annus Iubilationis appellari meretur.

Notandum etiam quod in quolibet quatuor anni temporum est quoddam ieiunium trium dierum. Ieiunium enim celebramus

in vere, ut sicut tunc omnia virent, ita in nobis vireant virtutum opera; vel ut in nobis temperetur ille humor qui assimilatur veri, sanguis scilicet, qui est calidus, humidus. Ieiunamus in aestate, ut simus ferventes in charitate; vel ut in nobis temperetur humor ille qui assimilatur aestati, scilicet cholera, quae est calida et sicca. Ieiunamus etiam in autumno, ut in nobis proveniat fructus bonorum operum; vel ut in nobis temperetur humor ille qui assimilatur autumno, melancholia scilicet, quae est frigida et sicca. Ieiunamus etiam in hyeme, ut sicut tunc defluunt folia ab arboribus et moriuntur herbae pravae, ita in nobis moriantur vitia et superfluitates a nobis defluant; vel ut in nobis temperetur humor ille, qui assimilatur hyeme, scilicet phlegma, quod est frigidum et humidum. Quibus igitur diebus et quando haec ieunia celebrari debeant per hos scitur versus:

*Vult crux, Lucia, Cineres, Charismata dia,
Ut sit in angaria quarta sequens feria.*

Quoniam etiam quorundam Apostolorum vigiliae ex primitivae Ecclesiae institutione ieiunium observant ad illarum retinentiam versus isti assignantur:

*Petrus et Andreas, Paulus cum Simone Iudas,
Ut ieiunemus nos admonet, atque Mathaeus,
Sabbata ieiunes, ni Solis lux tenet ipsos.*

In vigiliis etiam omnium aliorum, nisi solennis patriae consuetudo obviaverit, Dominus Papa ieiunare confirmavit, praeterquam in vigilia Ioannis Evangelistae, die secunda nativitatis Domini, et vigilia Philippi et Iacobi pridie Calendas Maii, cum tunc sit tempus iucunditatis et laetitiae. Sunt etiam praeter praedicta sex festa alia in anno canonizata in quorum vigiliis Ecclesia ieiunium celebrat, quae in his patent versibus:

Nat. Domini, Penteque, Ioan. Lau. supplico sancto.
Horum vigilia ieiunes, Luceque Marci.

Quoniam Adventus Domini penes literae Dominicalis diversitatem in anno solari variatur, ad habendum certum diem Adventus Domini sciantur isti versus:

*Andreae festo vicinior ordine quovis
Adventum Domini feria prima notat.
Si cadat in lucem Domini celebratur ibidem.*

Haec itaque de pertinentibus ad cursum solis scire sufficiat computistis.

ALTERA PARS COMPUTIS, DE DISTINCTIONE TEMPORIS RATIONE
MOTUS LUNE.

DE ILLUMINATIBUS LUNAE.

Cum ex motu Lunae quemadmodum et Solis plures Ecclesia consequatur utilitates, de eius motibus et luminis receptione et utilitatibus ex his consequentibus, quanto sensibilius poterit, existimo esse experiendum. Ut igitur innuit Martianus, quamvis Luna sapientium assertione menstruum lumen habere ostendatur, quod tamen pleni orbis sit semper in lumine non est dubium. Nam in parte illa qua se soli obiicit omni hemisphaerio collustratur. Unde cum nobis tricesima nullum lumen ostendet superius qua solem aspicit pleno lumine lucescit, et cum a sole discedens eum a latere coeperit intueri pro parte inferius lumen acquirit donec deinceps e contrario posita in tota parte quam terris opponit illuminetur. Circuit enim eius globum undique nitor solis, et medietati quam aspicit semper lumen indulget. Huius ergo primi luminis effigies cornibus circulata *μήνωειδος* dicitur, scilicet cum duobus punctis sive 6 gradibus a sole distans nobis apparere inceperit. Cum autem a sole distantis 90 partibus orbem eius radius solaris illuminaverit quasi septima *διχότομος* perhibetur. Aliis etiam 45 partibus iterum adiectis velut undecima *ἀμωχύνητος* nominatur. Cum vero 180 partibus a Sole discesserit, e contrario posita in parte inferiori nobis opposita universaliter illuminatur, tamquam quintadecima *πεντέληνος* dicitur. Postea quidem deficiens cum praedictis partibus nomina eodem modo recipit commemorata, prout patet in figura. Coniunctio dicitur etiam *νεομηνία*, *εὐνοδος* novilunium, interlunium, primatio, prima luna, *μήνωειδος*, corniculans,

falcata, nondum semiplena,
septima, διχότομος, ἡμίτομος, semiplena, dimidiata.
undecima, ἀμώχνητος, gibbosa, turgida.
decimaquinta, πανέληνος, plenilunium, oppositio.⁷

DE MENSIBUS LUNARIBUS.

Mensium autem lunarium quatuor sunt species. Est enim mensis peregrationis, mensis apparationis, mensis medicinalis et mensis consecutionis.

Primus itaque mensis, peregrationis scilicet, est spacium temporis quo Luna circuit zodiacum exiens ab uno puncto proprio motu rediens iterum ad idem, unde ex huiusmodi in circulo signorum revolutione annus a pluribus nuncupatur, cuius quidem punctalis perfectio secundum sensum scire sagatentibus ex motus ipsius lunae diurno commensurari potest. Est autem motus lunae diurnus 13 gradus, 10 minuta, 34 secunda, 58 tertia, 33 quarta, 30 quinta et 30 in sextis. Gradus quidem est 360 pars circuli, 60 vero pars gradus minutum, minuti 60 secundum et ita deinceps. Si itaque motus iste tum in se tum in suis partibus a toto zodiaco in sexta redacto quotiens poterit subtrahatur, exhibit mensis peregrationis, scilicet 27 dierum et 7 horarum et 43 minutorum, 7 secundorum, 15 tertiorum, 36 quartorum et 55 quintorum. Erit ergo mora Lunae sub quolibet signo duorum dierum 6 horarum 39

⁷Figura: de illuminatione lunae.

minutorum, frequens tamen universorum usus cum minimum desit 40, id est bessem horae complete supponit. Unde mensis peregrationis ex 27 diebus et 8 horis hac constabit suppositione. Unde versus:

Percurrit Cyclum viginti Luna diebus.

Septenisque suum, bis quatuor insuper horis.

Luna quidem cum praesit noctibus dies computationis eius a solis occasu incipere debet nobis econtrario diem solis discernentibus.

Secundus vero mensis dicitur apparationis, constans ex 28 diebus per 4 hebdomadas vulgariter distributis. Quarum prima est a principio apparationis lunae usque in diem septimum et ita deinceps. Unde quarta hebdomada in 28 die terminatur. Horae enim combustae, scilicet dum luna sub radiis solaribus moratur, non computantur. Cuius immutationis diversitatem quo ad nos corporum fluidorum sicut medullarum et cerebellorum natura et praecipue motus maris imitatur. Unde versus:

Hebdomada prima collabitur aequoris unda.

Aestuat unda maris tanquam fervore secunda,

Tertia cogit aquas minui, velut igne reducto,

Ultima fundit eas ex aere littore toto.

Et Lucanus:

Luna suis vicibus, Thetyn terrenaque miscet.

Cum enim luna meridianum teneat in austro sive punctum oppositum in angusto terrae, mare plenum est. Cum vero in oriente vel in occidente teneat horizontem, complete retractum est. Secundum medicos, quidem mensis iste supponitur 26 dierum et dimidii, Galeno perhibente. Unde mensis medicinalis in utriusque istorum mensium medio aequaliter consistens efficitur, scilicet 27 dierum duabus horis exceptis, et in 4 partitur septimanas dividendo eum per minutas.

Quartus quidem mensis consecutionis dicitur, et est spatium temporis quo luna accensa a sole peragrat circulum suum rediens ad punctum ubi accensa fuit; sed cum ibi solem non inveniat, quoniam sol interim fere pertransivit unum signum, ipsa attingit solem spatio 2 dierum et 4 horarum, 44 minutorum, trium secundorum et 16 tertiorum, et erit iterum in coniunctione cum sole. Deinde denuo procedens rursus nasci ac renovari dicitur. Unde mensis iste continet 29 dies et dimidium cum minutorum fractionibus, sicut patet per Alfraganum in 1 Differentia, et Ptolemaeum in dictione quarta Almagesti, et ex motibus solis et lunae diurnis. Si enim supponatur sol et luna in eodem puncto, et sumantur motus utriusque in tempore commemorato, invenietur sol pertransisse circiter signum unum et luna totum zodiacum et circiter signum unum. Erunt igitur iterum in coniunctione. Unde

iste appellatur mensis consecutionis, cuius quatuor a philosophis distinguuntur aetates: quarum primam calidam et humidam, secundam calidam et siccam, tertiam frigidam et siccam, quartam frigidam et humidam esse asserunt. Sic igitur patet quod quaelibet Lunatio naturaliter est 29 dierum et dimidii cum praedictis minorum fractionibus. Sed cum Ecclesia nec menses nec annos secundum numerum dierum incompletum computet, semper omissis minutiis ad embolismorum restorationem, transfert dimidium diem unius lunationis ad dimidium diem alterius lunationis, computans unam lunationem 30 dierum, aliam 29 dierum. Hoc tamen impeditur quandoque per bisextum, quandoque per embolismum, et per saltum lunae, et cum una lunatio secundum Ecclesiae computationem sit 30 dierum, alia 29, lunatio parium dierum attribuitur mensi impari et econverso. Unde versus:

Impar luna pari, par fiet in impare mense.

Si autem quaeratur quare sic, sciendum quod secundum primam mensium a Iulio institutionem mensis in impari loco positus semper fuit plurium dierum, et ratio exigit ut mensi in numero dierum maiori maior attribuaturn lunatio. Unde sic adhuc adolevit usus. Item lunatio dicitur semper illius mensis in quo terminatur. Unde versus:

In quo completur mensi Lunatio detur.

Si autem duae lunationes terminentur in uno mense, altera illarum erit irregularis scilicet embolismalis, id est hoc fiet mediante embolismo.

Qualiter autem bisextus impediatur lunationis alterationem sic patet. Regula enim est quod semper in anno bisextili lunatio Februarii est 30 dierum, in aliis vero annis 29 dierum, et hoc propter diem unum excrescentum per bisextum. Unde in anno bisextili lunationes tres erunt continuo triginta dierum, scilicet Ianuarii, Februarii et Martii.

Notandum etiam quod quoties lunatio Martii incipit ante locum bisexti et sit annus bisextilis, videtur duplex inconueniens contingere, scilicet quod Lunatio Martii sit 31 dierum, quod est inauditum, et Lunatio Februarii 29 dierum tantum, quod est contra regulam iam dictam. Ad hoc autem solvendum nota quod ubi lunatio scilicet Martii debet pronunciari prima, in tali loco lunatio Februarii pronunciabitur 30, et ita numerus designans primationem lunationis Martii intelligatur poni in sequenti loco. Hoc etiam notatur in quibusdam Calendariis per quendam numerum extra scriptum a tertio Nonarum Februarii usque ad locum bisexti, ita quod 19 ponatur extra contra pridie Nonas, 8 vero contra Nonas, et sic descendendo usque ad locum bisexti. Istud idem similiter notatur quibusdam lineis oblique protractis ab iisdem locis usque ad bisextum.

Ad habendum autem aetatem Lunae singulis annis, hoc est tempus accensionis eius a sole, primo inveniebantur tabulae a Romanis. Deinde Chaldaei aureum numerum invenerunt et Romam miserunt. Romani igitur numerum illum propter eius facilitatem et utilitatem in calendariis suis aureis literis scripserunt, unde adhuc aureus appellatur numerus. In primo igitur anno cycli decennovennalis per totum annum primationes lunae per unitatem notantur, in secundo per 2 et ita deinceps. Transiens igitur a Decembri in Ianuarium, transibit ab unitate in 2, ponendo binarium super E literam, pridie idus Ianuarii. Similiter variabitur ordo in caeteris annis, unde cum Cyclus iste contineat 19 annos, inter numeros praedictos 19 maximus erit. Ponitur ergo in prima die Ianuarii 3, quoniam ita contingit in tertio anno istius cycli quod in primo die Ianuarii semper luna fuerit prima, licet aliter modo contingat. Ab isto itaque numero formantur alii numeri sequentes per additionem 8, ita tamen quod si excrescat maior numerus quam 19 relictis 19 residuum sumatur. Hoc ideo fit quoniam primationem cuiuslibet anni sequitur immediate primatio anni octavo post, et si aliquid deletur in loco proximo scribatur, si vero nihil unus punctus vacuus relinquatur.

In aureo autem numero fere per totum calendarium minor sequitur maiorem numerum immediate, vel maior minorem

mediate. Istud tamen habet instantiam in 12 locis in calendario, ita quod in 6 locis iuxta principia 6 mensium, pari numero signatorum, ut secundo, quarto etc.; reliquae 6 instantiae sunt iuxta fines sex mensium continue sumptorum, habito initio a Iulio; quod totum in his continetur versibus:

Aureus hac arte numerus formatur aperte,
Prima dies Iani, quae ianua dicitur anni,
Ternarium retinet, ne posterus ordo vacillet,
Per praecedentem numerum dant octo sequentem.
Si decimum nonum superabis sic numerando,
Tolle decem, pariterque novem, reliquum retinendo.
Maiori numero debetur tertius ordo,
Si minor assequitur, maiori continuatur.
Per bissenata loca non est haec regula firma,
Tres Februi quarto nonarum continuato,
Quattuor apponas sub Aprilis pridie nonas.
Tot Iunius laterat, ubi nonis quattuor aptat,
Augusti capite tres debes continuare,
Quattuor Octobris lateratim pone Calendis,
In quartis nonis Duodeni denique mensis.
Linea tredecimum tenet una, simulque secundum,
Excipe sex menses, Iulium prius atque sequentes,
His quamvis crescat undenis summa propinquat.
Octo minor numerus sequitur, nec continuatur.
Tali quippe modo describitur Aureus ordo.

Est autem cyclus decennovennalis 19 annorum solarium revolutio in qua omnis lunae primationis diversitas ad pristinam revertitur positionem, secundum quod procedimus primationes lunationum assignando, et cui deservit aureus numerus. Romani autem quendam alium invenerunt cyclum qui lunaris dicebatur, penes quem lunae accensionis diem et horam assignaverunt, huic scilicet consimilem, in ordine tamen inceptions differentem. Incipit enim in Calendis Ianuarii tertio videlicet anno cycli decennovennalis, vel secundum alios quarto, qui in nomine tantum ab illis discrepant. Illum enim quartum quem alii tertium vocant considerantes annum cycli decennovennalis secundum lunationem paschalem incipere. Ut cum primus et secundus sint communes, tertius vero embolismalis, de necessitate oportet primum dicere quando primatio paschalis per 19 notatur pridie nonas Aprilis ab ista enim primatione usque ad illam quae per unitatem currit est annus communis, et ita deinceps. *Posita igitur unitate in Calendis Ianuarii, deinde facta formatione ad modum aurei numeri per additionem 8 formari habet uterque cyclus, itaque a Ianuario incipit.* Nos autem magis Chaldaeos et Eusebium Episcopum imitamur, qui a lunatione Paschali, ut dictum est, incipit. *Si autem scire volueris in quoto anno cycli decennovennalis simus, annis Domini ab eius nativitate inceptis adde unitatem et totum divide per 19, et si nihil fuerit residuum sumus in ultimo. Si vero aliquid residuum quicquid fuerit, ostendit nobis in quoto anno cycli sumus.* Sed si in quoto anno cycli lunaris

simus scire volueris, ab annis Domini subtrahe 2 vel adde 17 et divide ut prius.

Ne vulgarem incurramus dubitationem causam ignorantes cum realiter luna fuerit quarta secundum Ecclesiam quare prima pronuntiatur, sciendum quod Ecclesia supponit spatium 19 annorum solarium et cyclum decennovennalem penitus coaequari, scilicet in 19 annis solaribus. Secundum Ptolemaeum in tertia dictione Almagesti, sunt 6939 dies et 18 horae, licet nimis prodige fiat computatio. In cyclo vero decennovennali, sicut ab eodem in quarta dictione eiusdem habemus, sunt totidem dies et 16 horae et fere 2 tertiae horae unius. Unde in quolibet cyclo secundum istam suppositionem recedit media coniunctio sive primatio a nostra computatione per unam horam et tertiam horae unius. Sed Gamaliel secundum Iudaeos qui Pauli Apostoli erat magister, secundum vero nos Eusebius Caesariensis Episcopus et Hieronymus, in initio cycli illius in quo dominus incarnatus fuit consideraverunt lunam fuisse primam 10 Calendas Aprilis, et quod ad idem redit 10 Calendis Februarii; unde ibi unitas pro aureo numero ponitur. Sed ab incarnatione Domini elapsi sunt 1232 anni, a quo numero si cyclus decennovennalis quoties poterit subtrahatur, patebit quod in 65 horis et totidem tertiis a veritate nunc extenditur nostra computatio, quibus in diebus redactis habemus 3 dies et 14 horis. Unde per tres dies et dimidium recessit media coniunctio a loco primae impositionis. Nunc igitur

luna dicitur prima ubi deberet dici tertia, vel potius quarta, ut aureus numerus totaliter per 3 dies anticipetur, et unitas quae notatur super B, 10 Calendas Februarii, scribatur super F, 13 Calendas eiusdem; et sic de aliis omnibus eodem ordine qui nunc est observato. Sed quia in Concilio generali aliquid de Calendario transmutare prohibitum est, oportet modernos adhuc sustinere huiusmodi errores.

DE ANNIS LUNARIBUS, ET PRIMO DE ANNO COMMUNI.

Annorum autem Lunarium duo sunt genera: alius enim est communis, et alius embolismalis.

Communis autem est spacium 12 lunationum in anno solari vicissim transeuntem. *Et dicitur communis quoniam 12 habet lunationes sive menses lunares, sicut annus solaris 12 habet menses solares; vel quia duo anni communes fere semper simul eveniunt, sicut patebit in assignatione embolismorum.* Habet autem iste annus 354 dies et quintam et sextam unius diei, ut a Ptolemaeo et Alfragano perhibetur. Quod etiam ostendi poterit, cum habeat 6 lunationes 30 dierum et alias sex 29 dierum cum minorum computatione. Unde patet quod annus solaris excedit hunc annum communem in undecim diebus omissis minutiis. Si igitur illi duo anni simul incipiant, prius terminabitur annus iste communis per undecim dies quam annus solaris, sicut patet quando sumus in tertio anni

cycli decennovennalis. Quare si luna fuerit prima in Calendis Ianuarii, eodem die anno revoluto erit duodecima, propter excrescentem illorum undecim dierum. Consimilis erit variatio in Calendis cuiuslibet mensis et in singulis diebus anni. Unde propter hoc rectificandum invenerunt computistae duos numeros, scilicet epactam et regularem lunarem, per quorum coniunctionem adinvicem patebit aetas lunae in Calendis mensium. Ad habendum autem cuius aetatis sit luna in singulis diebus anni ex isto excessu undecim dierum de aetate lunae, respectu temporis praeteriti et futuri duae dantur regulae. Si ergo supponatur hodie alicuius certae aetatis, et velis scire in anno futuro hoc eodem die quotae aetatis erit, aetati lunae quam modo habet adde 11, et tantae aetatis erit luna in anno futuro eodem die. Illi iterum aetati Lunae adde 11, et habebis eius aetatem in anno tertio eodem die, et sic in infinitum; hoc tamen praenotato, quod si excresceret maior numerus quam 30, reictis 30 residuum pro aetate lunae ponatur. Si autem scire velis cuius aetatis fuerit luna, hoc eodem die in anno praeterito, tertio vel quarto, aetati lunae quam modo habet adde 19, et habebis aetatem eius in anno praeterito et sic deinceps; hoc etiam ut prius notato, quod si excrescat maior numerus quam 30, reictis 30 residuum pro aetate lunae ponatur. Unde versus:

Quinque dies et sex, ponas pro luca futura.

Et pro praeterita, quinque bis atque novem.

Licet in uno die quandoque fallat, quod universalius est pro regula instituat.

DE ANNO EMBOLISMALI.

Annus autem Embolismalis est spatium 13 lunationum, constans ex 384 diebus. Unde excedit lunarem communem in 30 diebus, annum vero solarem in 19 diebus. Et dicitur embolismalis ab embolismo, sicut bisextilis a bisexto. Quare videndum est quid sit Embolismus, et unde oriatur, et ubi in calendario interponatur.

Est autem embolismus lunatio 30 dierum nulli mensis attributa. Non enim alicuius mensis lunatio principalis dici meretur, cum ex reliquis aliarum mendicando perficiatur. Dicitur autem embolismus ab ἐμβολῶ, quod est excrementum. Sunt enim in cyclo decennovennali 235 lunationes sed tantum 228 menses solares. Unde si singulis mensibus singulae attribuantur lunationes, supererunt septem irregulares quae embolismi dicuntur ad quorum completionem, ut quilibet secundum sui proprietatem sit 30 dierum, lunationum totius cycli necessaria est aggregatio fractionum. In cyclo igitur decennovennali lunationes sunt 235, quod sic patet: in 12 annis communibus sunt 144 lunationes, in 7 embolismalibus sunt 91 lunationes, quae superioribus additae faciunt 235 lunationes, de quarum qualibet ad praesens omittantur 44 minuta, 3 secunda et 16 tertia, et

de numero illarum lunationum excipiantur septem ad opus 7 embolismorum, et reserventur illesae. De residuis autem, scilicet 288, fac semper unam 30 dierum et aliam 29 dierum, nisi quod in anno bisextili lunatio Februarii semper erit 30 dierum, quantoque parcius fiat computatio in cyclo, sunt quatuor bisexti. Ad completionem igitur quatuor lunationum Februarii in quatuor annis bisextilibus cycli, oportet mendicare 4 dies integros. Similiter et ad 7 embolismos perficiendos exiguntur septem dimidii dies. Resume igitur singularum lunationum totius cycli decennovennalis fractiones et multiplicentur per summam lunationum, et habebis 7 dies et 5 horas. Dentur igitur quatuor dies ex his integri 4 lunationibus Februarii in 4 annis bisextilibus, et de tribus residuis perfice sex embolismos, ut sit quilibet 30 dierum. Unde non relinquitur quod detur septimo Embolismo ad sui completionem nisi quinque horae. Sed cum ad similitudinem aliorum debeat esse 30 dierum, a lunatio Iulii in ultimo anno ccli decennovennalis quantum ei sufficit mutuetur, scilicet 7 horas, computatur tamen lunatio Iulii 29 dierum. Unde *iste dies quoad maiorem sui partem sic subtractus a lunatione Iulii dicitur saltus lunae, de quo patebit inferius.*

Quotus autem annus cycli decennovennalis secundum lunae primationis anticipationem apud Chaldaeos et Eusebium sit Embolismalis, patet per hunc versum:

Christus factus homo levat omnia reddita throno.

In hoc versu sunt septem dictiones septem embolismis deservientes, prima primo et sic deinceps. Vide igitur quota sit litera primae dictionis in alphabeto, et in tali anno cycli decennovennalis interponitur embolismus cui deservit illa dictio. Idem etiam facilius scitur per hos versus:

Tertius et sextus, octavus et undecinalis.

Et quartus decimus, decaseptimus, et decanonus.

Ad sciendum etiam quoto mense et quoto die eiusdem mensis interponi debeat embolismus, sciatur iste versus:

Mobilis ibo cifris ace liber habe coevum.

In hoc versu sunt septem dictiones 7 embolismis deservientes, prima primo et sic deinceps. Vide itaque quota sit litera prima alicuius dictionis in alphabeto, et in tali mense interponitur embolismus cuius dictionem sumpsisti. Vide etiam quota sit in alphabeto litera prima secundae syllabae eiusdem dictionis in alphabeto, et in tali die eiusdem mensis est sedes embolismi.

Notandum item quod multiplex error contingit in calendario per embolismum, quoniam error vicissitudinis, error terminationis, error variationis, et error

epactarum. Error vicissitudinis est quoniam simul sunt plures lunationes 30 dierum. Error terminationis est quando lunationes terminantur extra suos menses. Error variationis est quando mensis positus impari loco imparem habet lunationem, vel econverso. Error epactarum eo fit cum mentiuntur epacta et regularis.

Primus igitur embolismus incipit secundo die Decembris et terminatur ultimo die eiusdem; et contingit error vicissitudinis. Lunatio enim embolismalis et lunatio Ianuarii simul sunt 30 dierum; et si bisextus fuerit, 4 lunationes erunt simul 30 dierum, scilicet lunatio embolismalis, Ianuarii, Februarii et Martii. Embolismus iste assignatur in tertio anno cycli decennovennalis, quemadmodum secundum inceptionem lunationis Aprilis praedictum est.

Secundus embolismus incipit secundo die Septembris et terminatur die prima Octobris; et contingit error vicissitudinis, quoniam lunatio Septembris et embolismus, simul sunt 30 dierum; et assignatur in sexto anno cycli decennovennalis eadem die qua prius, ratione repetita.

Tertius embolismus incipit sexto die Martii et terminatur quarto die Aprilis; et contingit error vicissitudinis, quia lunatio Martii et embolismalis simul sunt 30 dierum; et si sit bisextus fuerit quatuor, scilicet Ianuarii, Februarii, Martii et embolismalis,

simul erunt triginta dierum. Contingit etiam error terminationis, quando lunatio Aprilis terminatur 3 die Maii, lunatio Maii secundo die Iunii, lunatio Iunii, prima die Iulii. Eo etiam anno mentiuntur epacta et regularis in principio scilicet Maii et Iunii, ut inferius patebit.

Quartus embolismus incipit tertio die Ianuarii et terminatur prima die Februarii; et contingit error vicissitudinis. Lunatio enim Ianuarii et embolismalis simul sunt 30 dierum, et si bisextus fuerit 4, scilicet lunatio Ianuarii, embolismalis, Februarii et Martii. Contingit etiam error terminationis, quia lunatio Februarii terminatur secunda die Martii, lunatio Martii prima die Aprilis. Praeterea tunc mentiuntur epacta et regulares in principio Martii, nisi sit bisextus.

Quintus embolismus incipit secundo die Novembris et terminatur prima die Decembris; et contingit error vicissitudinis, quia lunatio Novembris et embolismalis simul sunt 30 dierum. Et notandum quod embolismus iste est causa quare in secundo die Decembris in una linea ponantur duo numeri, scilicet 13 et 2. Si enim 13 poneretur in primo die, duplex contingeret inconueniens, scilicet quod embolismus praecedens tantum esset 29 dierum, et lunatio Decembris 30 dierum, cuius contrarium semper contingit. Embolismus autem iste intercipitur in decimoquarto cycli decennovennalis anno, ratione

praedicta.

Sextus embolismus incipit secunda die Augusti, et terminatur ultima die eiusdem, et contingit error vicissitudinis, quoniam lunatio embolismalis et Septembris simul sunt 30 dierum. Est autem embolismus iste in 17 anno cycli decennovenalis, sicut patet in praecedentibus.

Septimus embolismus incipit 5 die Martii et terminatur tertia die scilicet Aprilis; et contingit error vicissitudinis. Lunatio enim Martii et Embolismi sunt simul 30 dierum, et si bisextus fuerit, 4 lunationes simul eveniunt 30 dierum, scilicet Ianuarii, Februarii, Martii, et embolismi. Contingit etiam error terminationis, quoniam lunatio Aprilis terminatur 2 die Maii et lunatio Maii prima die Iunii. Mentiuntur etiam epacta et regularis in principio Maii et Augusti. Iste embolismus intercipitur in 19 anno cycli decennovennalis, prout patet in praecedentibus.

Intercalentur itaque in locis praedictis calendarii septem embolismi, ut aliis quanto minus derogetur lunationibus. Si enim alibi ponerentur plures mentirentur epactae et regulares et plures contingerent errores. Sed de malis duobus minus malum est eligendum dum alterum urget. Unde versus:

Si tibi concurrant duo turpia, dilige neutrum,

Sed quod turpe minus elige, Beda docet.

DE AETATE LUNAE ALITER INVENIENDA.

Ad habendum autem artificialiter et sine inspectione Calendarii quotae aetatis sit Luna in Calendis mensium et per consequens in quolibet die anni, inventi sunt duo numeri, epacta scilicet et regularis lunaris.

Est igitur epacta numerus 30 non excedens, proveniens ex superabundantia anni solaris ad annum lunarem communem.

Triginta non excedens dicitur, quia cum officium epacte sit ostendere aetatem lunae, nulla autem aetas lunae est maior quam 30 dierum, nec epacta maior debet esse.

Proveniens ex superabundantia etc. dicitur, quoniam epacta provenit excremento dierum in quibus annus solaris excedit annum Lunarem communem.

Primus igitur annus cycli decennovennalis epactam non habet, cum non praecedat annus ex cuius inequalitate epactam haberet; vel hac ratione, cum ultimus anni cycli sit quasi proximus ante primum, et ille habeat 18 pro epacta, et in eodem anno excrescant 11 dies ex annorum inaequalitate adinvicem, et unus ex Saltu, erunt in universo 30. Sed triginti sunt quasi nulla epacta, quia 30 adiuncta cum regulari debent deleri ad ostendendum aetatem lunae. Secundus autem 11 habet pro epacta,

tertius 22, quartus 3, quia abiiciuntur 30. Et ita formatur epacta deinceps per additionem 11. Idem scitur per hos versus:

Quae tenet undenas Aprilis luna Calendas,
Epactae numerum monstrat per quemlibet annum.

Vide quota sit luna undecimo Calendas Aprilis, et talis numerus erit epacta illius anni. Sed si ex abrupto alicuius anni quaeratur epacta, per hunc invenietur versus:

Deme unum, post adde novem, post undeviginti.

Ponatur enim primus annus cycli decennovennalis in radice pollicis, secundus in media iunctura, tertius in summitate, quartus iterum in radice, et ita circulariter computes annos cycli donec occurrat annus de quo quaeritur Epacta. Et si sistat in radice subtrahitur unitas, si in media iunctura adde 9, si in summitate adde 19, et habebitur epacta anni quaesiti. Dicitur autem epacta ab $\epsilon\pi\acute{\iota}$, quod est supra, et aucta, propter illud excrementum 11 dierum superius dictum; vel ab $\epsilon\pi\acute{\iota}$, quod est supra, et adiecta: ipsa enim super adiecta regulari in Calendis mensium, aetatem lunae ostendit.

Regularis lunaris est numerus 30 non excedens qui adiunctus cum epacta aetatem lunae in Calendis mensium manifestat. Triginta non excedens, expone ut prius de

epacta. Sed istud membrum qui adiunctus etc. ostendit tam officium epactae quam regularis.

Origo autem regularium est ex 5 diebus remanentibus ultra dies anni singulis mensibus per 30 distributos. Unde September 5 habet pro regulari. Vel quoniam quilibet mensis tot habet pro regulari quota luna fuit in Calendis eius in principio compositionis Calendarii et semper habebit. Unde ad hoc sciendum, supponatur quod simus in primo anno cycli decennovennalis, et patet propositum in Februario et in 6 mensibus ipsum sequentibus. In primo enim anno cycli decennovennalis est aureus numerus unitas decimo die ante Calendas Februarii, et sic luna est decima in Calendis eius. Unde 10 habet pro regulari. Similiter considera unitatem aureum numerum ante Calendas aliorum sex mensium sequentium et patebit regularis. Sed de Septembri et 4 mensibus illum sequentibus, supponatur 19 annus cycli decennovennalis, quia ille fuit quasi proximus ante primum, et secundum hoc September habet 5 regulari.

Si velis igitur alios regulares formare artificialiter uno supposito, sume numerum dierum Septembris et adde eius regularem, et a totali numero subtrahatur lunatio eiusdem mensis, et residuum erit regularis mensis sequentis, et ita deinceps, unde versus:

Quinque Sep. Oc. dantur No. De. septem ter tria

Ia. Mar.

Feb A, decem sumant, post unum cuilibet addas.

Habitis igitur epacta et regulari, si scire velis aetatem lunae in Calendis alicuius mensis, iungantur simul epacta anni et regularis lunaris mensis illius, et si ex illa coniunctione resultent 30 vel minor numerus, talis aetatis erit luna in Calendis mensis illius cuius regularem sumpsisti. Si maior, reiice 30 et residuum ostendet aetatem lunae. Unde Versus:

Dant Lunam mensis Epacta cum regulari,

Plus retinens, cum plus fuerit, triginta relinques.

Ad aetatem etiam lunae in Calendis mensium habitam, addatur numerus dierum mensis praeteritorum, uno die subtracto, ne bis primus computetur, et in die praesenti aetas lunae habebitur. Sed si summam lunationis mensis excesserit, residuo retento ipsa abiiciatur. Si autem qua hora luna a sole accendatur scire volueris, annum quotus fuerit cycli lunaris per 4 multiplica, et his dies anni praeteritos a Calendis Ianuarii usque in diem de quo quaeritur aggrega; quibus in unum redactis per quinque divide, et scies ea hora lunam accendi cui 5 defuerit, et in toto ipsius horae puncto quot cuius caeterarum superfuerint horarum. Si vero numeri aggregatio 60 excesserit, reiectis 60 de residuo fac ut prius; quod si nihil superfuerit, in ultimo puncto horae 12 luna

accenditur. Si igitur istorum asserit sententia, lunam semper quo ad nos in nostro accendi hemisphaerio, quod etiam autoritate Ptolemaei in Atarbe primo dicentis confirmatur. Luna quidem occidentem de iure vendicat cum a solis conventu discedens, ibidem semper novam lucem representet et primus eius incipiat ascensus. Luna autem singulis diebus in cremento 4 punctis removetur a sole in decremento Soli admovetur. Unde si scire volueris in quo signo sit luna, et quantum a sole distans, aetatem eius per 4 multiplica et per 10 partire, et quot fuerint denarii per tot signa distat a sole luna, et quot remanserint unitates per tot puncta in signo subsequenti pertransivit. Signum autem intelligo signi quantitatem, ut si luna coierit cum sole in 5 gradu Arietis, eadem cum fuerit quinta erit in decimo gradu Geminorum luna enim 13 partes peragente sol unam complet, ut omissis utrobique minutiis sensibile pro exemplo ponatur.

Si vero per quot horas luna de nocte luceat scire volueris, cum in cremento fuerit aetatem eius per quatuor multiplicabis, in decremento residuum aetatis eius quanto minus fuerit a triginta et per quinque partire quot igitur fuerint quinary per tot horas lucebit, et quot unitates per tot puncta. Unumquodque enim signum 10 habet puncta, hoc est horas duas, ut quinque puncta horam unam constituent in lunari computatione, et punctus quilibet 3 continet signi gradus.

Incipiunt autem epacta et regularis lunaris a Septembri. Et epacta est numerus variabilis, regularis vero numerus invariabilis. Si autem velis scire in quoto anno cycli epactarum simus, utendum est eodem artificio quo utebamur ad sciendum in quoto anno cycli decennovennalis essemus, addendo annis Domini unitatem, etc. Iste enim cyclus non differt ab illo nisi quod prius incipit spatio 4 mensium, scilicet a Septembri, ille vero a ianuario.

Mentiuntur autem epacta et regularis lunaris in toto Cyclo decennovennali quinquies, quoniam bis in octavo anno. Unde versus:

Fallitur octavo cum Maio Iulius anno.

Dicunt enim epacta et regularis in octavo anno lunam esse 28 dierum in Calendis maii, cum tamen revera sit 27 dierum. Dicunt etiam in eodem anno lunam esse 30 in Calendis Iulii, cum sit 29 dierum; et semel iterum in undecimo. Unde versus:

Ni sit bisextus fallit Martem deca primus.

Dicunt enim epacta et regularis in undecimo anno cycli lunam esse 29 dierum in Calendis Martii cum sit 28 dierum tantum, sed si bisextus fuerit, 2 dies computantur super sexto Calendas Martii. Unde tunc non fallit bis etiam in ultimo, Unde versus:

Ultimus Augustum fallit, fallit quoque Maium.

Dicunt enim epacta et regularis in ultimo anni cycli quod in Calendis Maii luna sit 29 dierum, cum revera sit 28 dierum, et dicunt etiam in eodem anno lunam esse 2 dierum in Calendis Augusti, cum in veritate sit 3 dierum, quod propter saltum lunae contingit, quoniam lunatio Augusti prius incipit uno die quam deberet. si non esset saltus lunae.

Est autem saltus lunae subtractio unus diei a lunatione Iulii in ultimo anno cycli decennovennalis. Et nisi fieret talis subtractio, post unum cyclum peractum luna diceretur prima quando esset secunda. Similiter post 15 cyclos peractos luna diceretur prima quando esset 15. Ecclesia enim supponit 19 annos solares ex toto adaequari totidem lunaribus. Sunt autem in 19 annis solaribus 6939 dies et 18 horae. Haec autem quantitas secundum Ecclesiam est eadem in totidem lunaribus. Sed Ecclesia menses et annos et cyclum secundum dies integros computans non expectat terminationem 18 horarum in fine cycli. Imo semper in sequentis diei principio cyclum inchoantis, computatur luna prima 10 Calendas Februarii, cum tamen in rei veritate deberemus expectare finem 18 horarum antequam pronunciaretur luna prima. Unde haec aetatis lunae anticipatio quae ex re nomen habet dicitur saltus lunae. Sed ne videamus ex tanto saltu in singulis cyclis inconveniens incurrere ut luna 25 prima dicatur, attende

quam subtiliter in 4 Cyclis omnia ad concordiam
reducuntur. Sunt igitur in quolibet cyclo secundum
veritatem 5 bisexti praeterquam in illo cuius quartus
annus est bisextilis. Sed de 4 cuiuslibet cycli in
capitulo embolismorum satisfactum est. Unde de quinto in
tribus cyclis restat assignatio.

Cyclus igitur cuius quartus annus est bisextilis
disserendi causa primus vocetur, et esto quod in
principio illius cycli fuerit luna prima quo completo in
sequentis diei principio, ut dictum est, luna prima
computatur cum tamen deberemus expectare 18 horarum
finem. Unde quo ad motus intensionem saltum facimus quasi
luna motum suum intenderet saltando. Fingimus enim eam
cum sole coniungi et esse primam in cyclo sequenti, eadem
ratione aliarum 18 horarum saltum facimus, et ita habemus
36 horas, hoc est diem unum et dimidium, dies integer per
bisextum intercaletur in lunatione Februarii pro quinto
bisexto secundi cycli. Dimidius autem dies reservetur
tertio cyclo, ex cuius saltu ratione dicta resultant 18
horae, unde cum residuo superiori habemus unum diem
integrum et sex horas. Dies integer intercaletur in
lunatione Februarii pro quinto bisexto tertii cycli,
ratione assignata. In quarto similiter cyclo habemus ex
saltu eius 18 horas, quibus aggregatis ad sex superius
relictas erit dies unus integer, qui interponatur
Februario pro quinto bisexto quarti cycli ut dictum est,
et nihil remanebit. Unde in sequentis cycli principio

luna et est et dicitur prima. Similiter faciendum est in 4 cyclis sequentibus et deinceps. Sic igitur in quatuor cyclis omnia ad concordiam reducuntur. Unde istus temporis spatium cyclus cyclorum appellatur.

In cuius autem quoto cyclo simus sic scitur. Numerus annorum cycli decennovennalis a bisextili proximo quovis ordine usque in finem eiusdem per 4 dividatur, et si remanserit ternarius, sumus in primo Cycli; si binarius, in secundo; si unitas, sumus in tertio; si autem nihil, sumus in ultimo.

DE FESTIS MOBILIBUS.

Festa autem mobilia cum ex lunationis discretione habeantur, ordinis ratione consequenter de eis est pertractandum. Est igitur festum mobile quod penes ascensum vel descensum lunationis celebratur, nullum sibi loco in Calendario habens assignatum. *Sunt quidem 5 festa mobilia, scilicet Septuagesima, Quadragesima, et Pascha, Rogationes et Pentecoste. Dicitur autem Septuagesima a 70, quasi continens 70 dies. Incipit enim a Dominica qua cadit Allelulia, et extenditur usque ad diem Dominicum in Albis. Quidam tamen supponunt eam in Pascha terminari, dicentes tempus a denario in quo terminatur de iure nominari. Illud autem tempus recolit Ecclesia ad memoriam 70 annorum in quibus filii Israel erant sub servitate Babylonica. Quadragesima similiter dicitur a 40, continet*

enim 40 dies. *Et illud tempus recolit Ecclesia quoniam Moyses tot diebus ieiunavit cum acciperet legem Domini. Elias etiam tot dies ieiunavit et raptus est in coelum, vel in locum Dei secretum. Christus etiam tot diebus ieiunavit et diaboli vicit tentationes. Et quia omnes Christi actio nostra est instructio, ergo et nos tot diebus ieiunare debemus. Sicut enim res nostras decimamus, ita et nos et vitam nostram decimare debemus Deo. Sed 36 dies et dimidius sunt decima pars anni. Quoniam autem nihil est a media die ieiunium inchoare ad mundificationem corporum ex ingurgatione 4 dies cinerum superadduntur aliis.*

Pascha, פֶּסַח, transitus idem sonant, sed a diversis linguis imponuntur. Pascha enim Hebraice, Πάσχα Graece, transitus Latine dicitur, quoniam tum de non esse ad esse factus est rerum transitus, atque angeli exterminatoris in vetere lege in Aegypto, necnon et Christi de mortalitate ad immortalitatem, nostram figurantis transitionem de vitiis ad virtutes, et de hac vita ad aeternam.

Dies autem Dominicus praecedens ieiunia rogationum Rogationes appellatur. Tunc enim non solum contra lupos corporales quemadmodum iamdudum in Gallia, sed et contra spirituales, ieiunia, processiones, et orationes continuare nos rogat Ecclesia.

Pentecoste dicitur a pente, quod est quinque, et Coste, quod est decem, quasi continens quinquies decem dies. Sunt enim 50 dies inter Pascha et Pentecosten utroque die incluso, et illud tempus recolit Ecclesia quoniam in monte ardenti Lex Moysi tunc data est, et dona Spiritus Sancti Apostolis.

Ad haec festum scienda quaedam genera numerorum inveniuntur, ut inferius patebit, et dies ante festum ubi huiusmodi numeri terminantur termini appellantur.

Terminus enim dies est clavem finiens, festum mobile futurum in die dominica proxima annuatim designans. Est itaque regula in computo quod terminus et festum nunquam simul sunt. Unde versus:

*Terminus et festum nunquam celebrantur ibidem
Lux teneat Domini post terminum proxima festum.*

Et hoc ne videamur Iudaeos imitari qui simul ponunt terminum et festum; vel quia terminus Paschae semper est 14 die lunationis Aprilis, et Pascha magis accedens ad terminum est quintodecimo die eiusdem lunationis, quare non poterunt simul esse terminus et festum. Ratio autem quare festa mobilia non habent certa loca in Calendario haec est. Pascha (quemadmodum caetera festa mobilia) semper debet celebrari die Dominico. Sed cum uno et eadem litera in Calendario non semper denotat diem Dominicum, non potuit Pascha nec caetera festa mobilia habere certum

locum in Calendario. Quidam etiam dicunt quod Dominus passus est 10 Calendas Aprilis; ibi enim fecit Adam, sicut dicunt Theophilus Alexandriae Episcopus et sui consentanei. Unde dicunt quod eodem die voluit pati pro primo homine et suo genere redimendo quo die ipsum formavit. Alii vero sicut Hieronymus et sui sequaces dicunt quod 8 Calendas Aprilis passus est Dominus. Ibi enim sumpsit carnem de beata virgine; unde dicunt quod eodem die quo carnem assumpsit passus est. Praeceptum etiam erat in veteri testamento agnum Paschalem post quartumdecimum diem lunationis Aprilis immolari ad vesperam, hoc est in principio 15 diei eiusdem lunationis. Ita Christus qui verus agnus est, et per illum agnum typicum figuratus, passus est in plenilunio, ut sicut eo tempore lumen nocti attribuitur copiosius, ita per passionem eius humanae naturae gratia redemptionis plenius exhibeatur. Cum ergo lunationes Aprilis quandoque sint prius, quandoque posterius, non potuit Pascha in certo loco assignare. Est autem infimum Pascha 11 Calendas Aprilis, quod sic patet: infima lunatio Aprilis incipit 8 Idus Maii, ubi 16 pro aureo numero assignantur. Lunationes quidem duae in proximo praecedentes sunt embolismales, duae vero reliquae illas praecedentes sunt lunationes Martii, licet posterior illarum duarum terminetur prima die Aprilis, quod contingit per quartum embolismum. Si igitur a prima lunatione Aprilis a iam dicta computentur 14 dies, primus terminus paschalis erit 11 Calendas Aprilis, et bene

*potest contingere, mediante variatione literarum
Dominicalium, quod Pascha celebretur in crastino illius
termini, hoc est undecimo Calendas Aprilis. Unde ibi
solet notari primum sive infimum Pascha. Ex dictis patet
quod bene datur haec regula:*

Post Martis Nonas ubi sit nova luna require.

Bis septem complete dies ut Pascha sequatur.

*Omnes enim lunationes Aprilis incipiunt post Nonas
Martii. Quod autem ultimum Pascha celebretur 7 Calendas
Maii sic patet. Nam ultima lunatio Aprilis signatur
contra Nonas ipsius, ubi aureus numerus est 8, quamvis
illa terminetur tertia die Maii, sicut sua praecedens
secunda die Maii, quod contingit propter tertium et
ultimum embolismum. Si igitur ab ultima lunatione Aprilis
iam dicta computentur 14 dies erit ultimus terminus
Paschae 14 Calendas Maii, et potest contingere mediante
variatione literarum Dominicalium quod ille terminus sit
dies Dominicus, unde dies Paschae celebrabitur in
sequenti Dominico, hoc est 7 Calendas Maii. Ex his patet
quod in illis 35 diebus qui sunt inter 11 Calendas
Aprilis et 7 Calendas Maii, sive prius sive posterius
semper habet Pascha celebrari, ita quod in anno communi
descendat terminus Paschae per 11 dies, in anno
embolismali ascendat per 19 dies. Unde versus:*

Pascha nec undenas Aprileis ante Calendas.

Nec post septenas Maii valet esse Calendas.

Embolis ascendens Canonis de lucibus anno.

Communi recidit undenis terminus eius.

Magnus autem cyclus Paschalis est qui multiplicato solari per lunarem 532 conficitur annis, quam cum ex ordine mensium dierumque summam compleverit mox in seipsum revolutus omnia quae ad solis lunae que cursum pertinent, eodem quo prius praeteriunt semper tenore restaurat. In cuius quidem quoto anno fueris sic scitur. Annis Domini addantur 20, nam vigeno primo Christus natus fuit anno, et totum per summam cycli dividatur, et si nihil fuerit residuum, sumus in ultimo; si vero aliquid, ostendet nobis in quoto anno sumus.

Ad habendum autem 5 festa mobilia, communiter inventi sunt quidam numeri qui claves dicuntur. Unde clavis est numerus in unoquoque annorum cycli decennovennalis diversus, festorum mobilium certitudinem per terminum ostendens. Sicut enim per claves fit introitus in atrium ita per numeros istos in notitiam festorum mobilium. Cum igitur in cyclo decennovennali sint 19 anni, unusquisque suam habebit clavem, sicut in figura cycli decennovennalis, epactarum et clavium figura praesenti subiicitur.⁸

Primus itaque 26 habet pro clave, a qua formari possunt

⁸Figura: cyclus decennovennalis, epactarum et clavium.

*claves sequentes, per additionem 19; hoc tamen
praenotato, quod si excrescant 40 vel maior numerus,
reiiciantur 30 et residuum erit clavis anni sequentis.
Sed si ex abrupto quaeratur clavis alterius anni, tunc
his versibus invenietur:*

*Vicenos quinos, tredecim, plus asse tricenis,
Undevigin hepta digitis pro Clavibus apta.*

*Computetur enim per omnes digitos sinistrae manus donec
venias ad annum cycli de quo clavis quaeritur, sumpto
initio a pollice; et si annus quaesitus sistat in
pollice, illius anni numero adde 25; si in indice, 13; si
in maiori digito, 31; si in medico, 19; si in auriculari,
7; et versibus sic expositis claves manifestantur, hoc
tamen praenotato quod si excrescant 40 vel maior numerus,
reictis 40 residuum pro clave sumatur. Loca autem clavium
his assignantur versibus:*

In Iano prima, supremaque Marte secunda.

Aprilis terna sex monstrat et ultima Claves.

*Habitis igitur clave et loco clavis, si festa mobilia in
anno quocunque scire volueris, sumatur clavis illius
anni, et habendum festum quodcunque mobile, tot dies
computentur a loco clavis illius festi quot unitates
clavis continet, et dies ubi terminatur talis computatio
terminus dicitur; et in die Dominica proxima sequente*

celebratur festum; hoc tamen praenotato, quod ad habendum Septuagesimam vel Quadragesimam in anno bisextili, clavi addenda est unitas. Aliter enim contingeret Septuagesimam et Quadragesimam per clavem prius celebrari quam deberet 7 diebus. Per hos autem versus specialiter habetur terminus Septuagesimae, et per consequena caetera festa mobilia:

A festo Stellae numerando perfice lunae.
Quadraginta dies, et Septuagesima fiet,
Si sit bissextus lux additur una diebus.
Si cadat in lucem Domini suppone sequentem.

A principio lunationis illius in qua est Epiphania Domini, quae proprie Festum Stellae dicitur, sive illa fuerit in Ianuario, sive in Decembri, computentur 40 dies descendendo, et quadragesimus erit dies terminus Septuagesimae, et in die Dominica proxima erit Septuagesima. Si sit bissextus, addatur dies unus, sicut in versibus innuitur.

Ad habendum autem terminum Paschae sciantur isti versus:

Esse gravem nobis bello carnem caveamus.
Bellum saepe gerens etenim puto deiicit hostem.
Mox animae lucrum invenies cum relligiosis.

In his versibus sunt 19 dictiones deservientes 19 annis

Cycli decennovennalis, prima primo et sic deinceps. Si igitur alicuius anni cycli decennovennalis terminum velis invenire Paschalem, sumatur dictio serviens illo anno, et si terminetur in M literam, terminus Paschae erit in Martio, tot diebus computatis a fine Martii ascendendo quota est prima litera illius dictionis in alphabeto; et ubi terminatur talis computatio, ibi est terminus Paschae. Si autem dictio non terminetur in M, terminus Paschae erit in Aprili tot diebus computatis a principio Aprilis descendendo quota est prima itera eiusdem dictionis in alphabeto.

Per hos autem versus scitur quot septimanae sunt inter Dominicam proximam, sive ante, sive post natale Domini et Quadragesimam:

Ira gravat karos, hanc gignit kaumatos hostis.

Lex iubet hostilis kaveatur inertia gentis.

Karceris humani gerit instans hora levamen.

Hi enim dictiones 19 serviunt 19 anni cycli decennovenalis, prima primo et sic deinceps. Vide itaque quota sit litera prima dictionis anno servientis in alphabeto, et tot septimanae erunt in tempore quaesito. Ne tamen quandoque fallant caveat sibi calculator, non enim veritati viciniore assignari potuerunt dictiones.

QUID LUSTRUM, INDICTIO ET SECULUM.

In hac postremo operis particula de temporibus partibus compositioribus in usu etiam Ecclesiae rarioribus consequens est determinare.

Est igitur Lustrum spatium quinque annorum a Romanis consideratum ad tempus dictaturarum, quod descendit ab hoc verbo polysemo Lustrum lustras. In fine enim quinquennii cuiuslibet et in principio dictaturae circumibant cives Romani civitatem cum cereis et candelis, et postea in Martio campo dictatorem elegerunt. Adhuc etiam Ecclesia memorat lustra, dicens, Lustra sex qui iam per acta etc. Indictio est spacium 15 annorum ad recipienda ab extraneis tributa institutum, et dicitur ab indico, cis, quod ad pontifices pertinet. Unde versus:

Edicunt reges indicit festa sacerdos.

Cum enim Romani dominarentur fere universis nationibus terras fecerunt sibi tributarias, praecipientes ut terrae remotiores propter difficultatem transitus in fine primi quinquennii persolverent aurum ad dominationis typum, in fine secundi argentum ad stipendia militum, in fine tertii aes et ferrum ad armorum reparationem. Unde indictio a quibusdam aerea ab aere dicitur, vel ferrea a ferro, in fine eius soluto. Unde instituerunt Romani quod nullum privilegium, nullum etiam conventio scripto commendata esset stabilis vel firma nisi haberet annum indictionis annotatum; et hoc ne tributorum solvendorum

memoria laberetur. Nos autem in tribus utimur indictione, scilicet in privilegio, in cereo Paschali et in dedicationibus ecclesiarum. Incipit autem cyclus indictionis in Septembri, quia cum tunc sit ubertas fructuum bene possunt solui tributa. Si autem placeat cuiquam scire in quoto indictionis simus annis Domini addantur 3, quoniam Dominus dicitur natus fuisse in quarto anno indictionis, et totum dividatur per 15; et si nihil fuerit residuum, sumus in ultimo anno indictionis, si vero aliquid, ostendit nobis in quoto anno simus. Est etiam hoc nomen indictio aequivocum ad totum Cyclum et ad quemlibet annum illius cycli. Saeculum autem dicitur spatium 100 annorum: unde multa praeteriere secula. Seculum etiam dicitur mundus et tota machina mundana cum suis contentis. Aevum vero dicitur spatium mille annorum. Dicitur etiam aevum idem quod aetas: unde homo magni aevi dicitur. Dicitur etiam aevum idem quod mora: unde Boetius:

O qui perpetua mundum ratione gubernas.
Terrarum coelique sator, qui tempus ab aevo
Ire iubes, stabilisque manens das cuncta moveri.
Tu stabilire velis opus hoc per temporis aevum.
M. Christi bis C. quarto deno quater anno.
De Sacro Bosco discrevit tempora ramus.
Gratia cui nomen dederat divina Iohannes.
Annuat haec nobis huius sic carpere fructum.
Ecclesiae Christi, quod nos hinc fructificemus.

Amen.

