THE EQUATORIE OF THE PLANETIS

I

INTRODUCTION

THE unique manuscript, Peterhouse (Cambridge) MS. 75. 1, from which this text is edited, has considerable claim to attention by virtue of its astronomical subject-matter and also because this unusually technical material is presented in Middle English instead of the medieval Latin which was in use at this date for scholarly writings. These facts alone would be enough to make it desirable that an edited text should be available. The importance of the manuscript is, however, much increased by the possibility that a portion of the volume may be attributed to Geoffrey Chaucer, and was perhaps written in his own hand.

If this claim can be firmly established we should have a complete holograph text which, in addition to its sentimental value, might have great use in textual criticism of the Chaucer canon. All of Chaucer's known works have come down to us only through scribal copies, and of these very few are believed to have had a simple textual history. There are, it is true, certain official documents which have been proposed as Chaucer holographs, but until now it has not been possible to substantiate any of these claims. The hand of this Peterhouse manuscript is sufficiently distinctive to make it possible that other documents and manuscripts might be recognized by this means.

To some it may seem surprising that the subject of this manuscript is neither literary nor an elementary presentation of science or philosophy. It is well known that the poet was intensely interested in the science of his time; he had translated the *De Consolatione Philosophiae* of Boethius into the vernacular, and his poetry contains many allusions and direct references which indicate a detailed understanding of science, particularly of astronomy. But besides these incidental manifestations of 'the learned Chaucer' there has come down to us one completely scientific work, the *Treatise on the Astrolabe* which is said to have been written in 1391 for the poet's ten-year-old son, 'litel Lowis'.

The Peterhouse MS., whoever may have been the author, must be regarded as a companion work to the *Treatise on the Astrolabe*. The astrolabe is an instrument designed to assist all calculations of the apparent positions in the heavens of the Sun and the stars. The new text is concerned with the complementary problem of calculating the positions of the planets, and it describes the con-

struction and use of a special instrument for this purpose; this type of instrument being well known to medieval writers as the *equatorium planetarum*. The astrolabe has long been recognized as one of the most important instruments in the early history of astronomy, and about 1000 European and Oriental examples are preserved in museums and private collections. Fate has been less kind to the equatorium [or equatorie, as this manuscript anglicizes the term], for very little has been published about this equally important instrument, and only two incomplete examples of the actual instrument have been traced. Undoubtedly this is due to the fact that an astrolabe could readily be embellished with all the art of the metal-worker, whereas the equatorium was nearly always so complicated that it could not readily escape a purely utilitarian appearance and the consequent much smaller chance of being preserved.

The connection between the *Treatise on the Astrolabe* and that contained in the present manuscript goes further than the obvious connection between the two instruments described. In its own day the equatorium must have been regarded as a useful, or perhaps necessary, complement to the astrolabe. For the casting of horoscopes, for example, the positions of the stars and the Sun could be found with an astrolabe, but the Moon and the five planets could have their places determined only by a calculation made directly from tables or with the assistance of some type of planetary instrument. As will be shown, the direct calculations on the basis of Ptolemaic theory were too cumbersome and unsuitable for routine use. If Chaucer had laid aside his first treatise and cast around for some similar subject for further writing, it would have been very natural for him to choose the complementary instrument as a topic. Indeed, if we accept a hint contained in the *Astrolabe* that Chaucer had previously written a treatise on the 'Solid Sphere', the three works together would make a very suitable and complete treatise on the basic theory and the instrumentation of medieval astronomy.

Just as the *Astrolabe* is largely borrowed from the *Compositio et operatio astrolabii*, the Latin version of a work by Messahala, the *Equatorie* is clearly derived from a Latin version of some Arabic treatise. Unfortunately, we are unable at present to trace either the Arabic or the Latin texts, but there is a possibility that the Latin treatise was written by Simon Bredon, an astronomer of Merton College who died in 1372. Our manuscript was written about twenty years after Bredon's death, but the Peterhouse library catalogues, stretching back to the beginning of the sixteenth century, agree in ascribing the *Equatorie* to Bredon, in spite of the fact that there is nothing in the text itself to suggest any connection with him. The only evidence indeed is a librarian's note on the end leaf which transcribes biographical details of Bredon from the (incorrect)

information supplied in the works of John Bale. If not entirely false, this ascription to Bredon can only be based on a Latin text about the equatorium which was written by that author but is now lost.

Whatever the origin of the treatise contained in the Peterhouse manuscript we still have to determine the author of the Middle English text, whether it be adaptation, translation, or partly original work. Only a small portion of the manuscript volume consists of the text which we have named *The Equatorie of the Planetis* (adapted from *equatorium planetarum*). In addition, there is a set of astronomical tables written in the same hand as the *Equatorie*, and sandwiched between these two companion sections is a long set of astronomical tables written in a contemporary but more formal hand. It seems likely that the text and tables were originally written on loose quires of vellum and possibly remained in this state until they were bound after acquisition by Peterhouse. If this is so it must be supposed that they are not now in their correct order; the logical sequence would be to have the text followed by the tables which are in the same hand and are referred to in that text. The second set of tables must be looked upon as a professionally made copy, probably ordered by the writer to supplement his own short set, and these should have been bound at the end of the volume.

There are many indications that the writer of the text and short set of tables was no scribe or secretary, but rather the original author. He was certainly not the inventor of the instrument in question, or the compiler of the tables—for these are drawn from the famous Alfonsine Tables—but it seems that the author is working out his English version of the text as he proceeds, and modifying it to suit his purposes. But this point, as also the question of the identity of the writer, are dealt with in later chapters.

II

PROVENANCE AND PHYSICAL DESCRIPTION OF THE MANUSCRIPT

THE Peterhouse collection of some 276 manuscripts is preserved in the Perne Library of that College, and constitutes an excellent example of a medieval collection, all the more important because of the unusually good records which enable its development to be traced back to the first full register of books, dated Christmas Eve 1418.

MS. 75 of this collection, the subject of our present study, is described in the modern catalogue[1] as consisting of two separate parts; these are related by nothing more than the chance which led to the second, thin manuscript being selected for binding with the larger first part, the folios of which are of approximately the same size. M. R. James gives the following titles of the parts:

I. *Symon Bredon de Equationibus Planetarum*, followed by directions for making an astrolabe (?),[2] in English.

II. 1. *Expositio fr. Nich. Tryvet super Aug. de ciuitate dei.*
2. *Vegetius de re militari.*

The presence of this composite volume in the Library can be traced back through all the catalogues, printed and manuscript, as far as 1589. In that year, before the death of Dr Perne and the subsequent accession of the large collection bequeathed by him, there was compiled a list of all the books in the College Library, which contains an entry:[3]

No. 29. Classis 10ª in parte Australj.
Simon Bredon equat. Planet: Nicholaus Trivet in August: de civitate Dej.

This description is sufficient to identify the item with the present MS. 75 which must, even then, have contained the two separate parts noted above. The absence of any mention of the Vegetius is not surprising, since this is written in the same hand as the work by Trivet and follows it, without any break, in the middle of a page.

[1] M. R. James, *A Descriptive Catalogue of the Manuscripts in the Library of Peterhouse* (Cambridge, 1899), p. 93.
[2] (?) *Sic* M. R. James.
[3] The list is on f. 12 of what is now MS. 400: *Nomina librorum qui erant in Bibliotheca Coll(eg)ij ante Doctoris Perne mortuum.*

Another point of interest in the 1589 entry is that the title of Simon Bredon's text is given as *equat. Planet.* which might be expanded as either *Equationum Planetarum* or *Equatorium Planetarum*. Although both of these titles are, at first sight, equally likely, it must appear on detailed examination that the latter form was probably the original intention, since similar forms are to be found referring to other treatises on the equatorium, notably that of Campanus of Novara. It seems likely then that the present volume contained the title, only in the abbreviated form, and this has been expanded erroneously in all catalogues from that of 1589 until the present day. A similar error seems to have been committed by John Bale in his *Scriptorum Illustrium maioris Brytannię* (Basel, 1557) where we find on p. 489, 'Simon Bredon,. . . *Claruit anno domini 1380 sub Ricardo Secundo*', and in the list of his works '*Aequationes planetarum, lib. 1*' (no incipit given), which seems to refer to the same work, since we know of no other planetary writings by this author. As it is also likely that no other copies of the Peterhouse manuscript have ever existed, it would seem that Bale's entry is founded on an examination of this very manuscript. This is interesting for, as will be shown later, the only reason for ascribing the work to Bredon is the existence of a sixteenth-century note at the end of the volume—and this note is copied verbatim from Bale's entry on Bredon. It is known that a copy of Bale was bequeathed to the library by Perne in 1589 and remained there until 1760 at least (former press mark, 07 05 08).

It is possible to take the record back a little further than the catalogue of 1589, for a mention of this manuscript occurs in the *Collectanea* of John Leland (James, *op. cit.* p. 362), where he lists the Peterhouse manuscripts which interested him during a tour of exploration, probably about 1542. No. 43 on this list reads: 'Tabulae aequationum planetarum, autore Simone Bredon', and this almost certainly refers to our MS. 75. 1.

Having established that the manuscript has been continuously in Peterhouse from about 1542 until the present day, we must consider the preceding period. It will be shown that the text was written in 1392 and used by the author until 1395, possibly remaining in his possession until about 1400; in the intervening years, from 1400 until 1542, we have little trace of the manuscript. The interval may be narrowed slightly if one can assume that the omission of this manuscript from the earliest Peterhouse catalogue of 1418 implies that the work had not come into the possession of the College by then. This catalogue is unusually precise and yet contains no title which, by any stretch of imagination, might be identified with the present manuscript, and it would seem a safe assumption that the manuscript must have come to Peterhouse some time between 1418 and 1542.

The only clue to its history during this period is an inscription on the manuscript at the foot of the otherwise blank folio 74 verso (see Plate XIII*d*). The first part of this inscription is difficult to decipher, but for what it is worth we may render it as:

G^{m}...¢ S 1461 .19. meridie of august.

From its placing on the end folio of what is now the first of the two quires containing our text, and from the fact that the same hand has written a minor addition to a table on folio 9 verso, we must infer that this is the mark of some owner who made at least slight use of the manuscript at this date when it was still unbound, or at least bound in a different order which placed folio 74 verso at the end. In the absence of any other evidence, one may suggest that this owner of 1461 represents the last user of the manuscript before it came into the possession of Peterhouse; he might well have been the donor. Significantly enough the period indicated is one during which many astronomical manuscripts of similar type came to the College.

Before considering possible donors from the middle of the fifteenth century we must note a possibility that the manuscript made an earlier appearance in Cambridge. It may well be a significant coincidence that the first flourishing of science in Cambridge was due to the influence and example of John Holbrook, Master of Peterhouse from *c.* 1421 to 1436. He was admitted as a Fellow of the College in 1393, and already by 1406 his work on astronomical tables seems to have been considerable. His famous *Tabulae Cantabrigienses* are said to have been compiled in 1430,[1] but evidence of earlier work in Cambridge, almost certainly attributable to Holbrook, is to be seen in British Museum MS. Royal 12. D. vi at folio 43 verso, where we find:

> Notandum q*uod* anno *Christi* 1406 in mense Julij examinate fueru*n*t cu*m* maxima diligencia iste tabule p*re*cedentes et p*er* 5 ho*mine*s valde morose atq*ue* delib*er*ate op*er*antes in vniuersitate Cantabr*igie* correcte videli*cet*, tabula equ*a*cionum om*nium* planeta*rum* *secundum* 2 exemplaria Alfonsi, tabule mot*us* sol*is* et lune in una hora *secundum* 2 exemplaria mag. I. de Lineriis, Tabule u*ero* ascens*us* in circulo dir*ecto* et circulo obliquo *secundum* unu*m* exemplar Mag. Ioha*nnis* Mauduth. Et om*ne*s iste tabule p*redicte* *secundum* 4 exemplaria mag. Willi*elmi* Reede, vnde p*er* easde*m* restat *cum* audacia calculare.

Since no such collections of astronomical tables appear in the Peterhouse catalogue of 1418, Holbrook and his four companions must have had the

[1] R. T. Gunther, *Early Science in Cambridge* (Oxford, 1937), p. 138. He gives a facsimile of part of the tables from MS. Cam. U. Lib. Ee. 3. 61 and notes that the Preface is also to be found in MSS. Ashmole 340 and 346. A fine copy of Holbrook's tables is in Peterhouse MS. 267.

volumes in their own possession or been able to borrow them from elsewhere for their grand collation. It is possible that the manuscript we are concerned with was first sought out by the Holbrook school in their search for full and accurate tables. Certainly the tables in our volume are remarkably free from the usual scribal errors and therefore of considerable value to a man like Holbrook.

If, however, the manuscript did not come to the College until a later date, we have the choice of at least three men, all of whom are known as donors of similar texts. In the Register of the College which contains the catalogue of 1418 there are a number of entries which record subsequent additions to the Library up to about 1500. Towards the end of this section occur the names of two donors responsible for a good collection of astronomical books, Roger Marshall and John Warkeworth. In this list the following items call for special note:

201 includes a *Theorica Planetarum*, but this seems to be only one short tract in a large collection bound in one volume.

207 *Theorica Planetarum cum diuersis tabulis astronomie*. First words on second leaf 'inferior orbis'. Last leaf but one, blank. These details do not agree with our MS. 75. 1.

210 contains, amongst other things, a *Theorica Planetarum*, but the volume is probably to be identified with the copy of Holbrook's tables, now MS. 267.

211 Another collection containing a *Theorica Planetarum*; again it is probable that this is but one short tract in a large collection.

Following these entries, on p. 22 of the Old Register, a piece of paper has been stitched to the vellum; it is headed in pale ink:

Billa magistri Rogeri Marchall de dono suo scripta propria manu sua a° dni Millesimo 1472.

i	Perspectiua Witelonis	ponantur in libraria
ii	Arithmetica Jordani cum commento	vestra secretiori in
iii	Exposicio super theoricam planetarum	vinculis si vobis
iv	Liber animalium Alberti	videatur.
v	Tabule equacionum planetarum magne	ponantur in vincula in
vi	Logica ffratris Rogeri bacon	apertiori libraria
vii	...etc.	vestra.

Items iii and v cannot be certainly identified with any of the extant manuscripts, and either is a possible title for MS. 75. 1.

Roger Marshall gave many books to the libraries of King's College and Caius College, as well as to Peterhouse, but all that is known of the provenance of his manuscripts except that many of them came from Bury. The donor,

John Warkeworth, must also be mentioned, for although there are no astronomical manuscripts which bear his name, many of his volumes are marked as having been bought in 1462 and 1463—which is close to our owner's mark of 1461. Warkeworth was a Fellow of Merton College, Oxford, in 1446, and subsequently Principal of Bull Hall and Nevill's Inn; he was Master of Peterhouse from 1473 to 1500.

Another remote possibility is provided by the fact that William Gage, S.T.B., clerk, of Woolpit (west Suffolk), mentions in his will of 1500[1] an astrolabe and various books which he left to Peterhouse. Unfortunately, the books are not described in sufficient detail to make identification possible, but the astrolabe is recorded in the Old Register. A similar instrument is said to have been given by Warkeworth. All these entries tell us nothing more definite than the popularity of such astronomical texts and instruments at Peterhouse towards the close of the fifteenth century. It seems likely that if our manuscript was not acquired by Holbrook *c.* 1400, it must have come from Roger Marshall or one of his contemporaries after 1460.

The absence of markings in other hands on such a useful working set of tables may be taken as evidence (albeit negative) that the manuscript was not in use by any other person for some decades after leaving the author's hands. If it had been used it is almost certain that the user would have added up-to-date radices to facilitate his calculations. Furthermore, after an interval of about forty or fifty years, such tables might have become so erroneous as to require revision of their constants; such a period may be taken as the natural 'working life' of such a table without revision, and after this time a set of tables of this nature would tend to be disregarded as a scientific aid and be preserved (if at all) only as a curiosity or through inertia.

The state of the volume therefore would suggest that it lay unused for a few decades from the time when it left its writer's hands in 1400 or just before. By the middle of the fifteenth century part of the tables would have become obsolete, and the owner of 1461 would probably have regarded it as a manuscript of no great importance. Possibly this owner, or a person to whom the manuscript passed shortly afterwards, presented it to Peterhouse where it is still preserved. It is probable that the manuscript was bound, or even rebound, after it came to the College, and the part which is now MS. 75. II was almost certainly added at this time.

Part of the original binding, or perhaps an early wrapper, has been preserved as a vellum fly-leaf used in the nineteenth-century rebinding of the volume. It seems that a large sheet of thick vellum was folded down the

[1] Canterbury Cathedral Chapter Archives. Register F, f. 131 verso.