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The Equatorie of the Planetis

By DR. DEREK J. PRICE

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In the course of a study of medieval scientific instruments an examination was made of MS. 75.I. in the library of Peterhouse, Cambridge. It is a large folio volume containing 78 leaves of astronomical tables and text in English, and the catalogue of the library ascribes it to the Merton College astronomer, Simon Bredon. It is now suggested that this attribution is false, and that the text might well be an unknown work by Geoffrey Chaucer, written perhaps in continuation of his *Treatise on the Astrolabe*. Further, the appearance of the text indicates that this is an author's holograph draft, and if so we have for the first time a sample of Chaucer's own hand, and a specimen of his orthography and language without the intervention of scribal perversion which occurs with all other Chaucer MSS.

A preliminary account of the manuscript volume has already been published*, and a full edition containing facsimiles, a transcript and translation, and the usual critical apparatus is in course of preparation for the Cambridge University Press. A brief outline only is therefore given of the main features of the text and the indications that this may be a Chaucer holograph. It must be stated at the outset that no strong proof can be given, and even an estimation of the probability is difficult until the text has been made available to scholars.

The manuscript bears the date 1392 on many of the astronomical tables, and *passim* in the text; it was therefore written on or about this date. The early history of the volume is difficult to trace, but it seems to have come to Peterhouse during the fifteenth century, and by *ca.* 1540 it begins to appear in the library catalogues as *Tab. aequ. planetarum autore Simon Bredon*. During the eighteenth and nineteenth centuries the volume suffered through being bound in too tight a fashion, and at least one thick fly-sheet was slashed out by someone wanting a good piece of vellum for other purposes. The manuscript has recently been repaired and rebound.

The text is heavily corrected and contains many interlineations in the original hand; it is striking that these amendments do not take the form of the usual correction and supervision seen in scribal manuscripts, but are rather alterations in style and content such as would be consistent with a heavily "polished" author's draft of a work in process of composition from rough

* The Times Literary Supplement, 29th February and 7th March, 1952. An amplified version with many facsimiles has appeared in *Journal of the South-West Essex Technical College*, Vol. III, No. 3 1952, pp. 153-168.

notes or from translation, or even from afresh. The suggestion that the work is holograph is supported by the linguistic analysis*, which indicates a homogeneity that would probably have been lost if the text had passed through two or more hands.

If the text is holograph then Simon Bredon could not have written it, for he is known to have died in 1372, two decades before the date of the volume. It is however possible that the text is a free translation or adaptation from a Latin work by Bredon which cannot now be found. Even if this is so one cannot credit Bredon with complete originality, for the presence of certain technical terms and the form of the doxological incipit provide unmistakable evidence that the parent text has come down to us through the Arabic.

The pointers towards a Chaucerian authorship are as follows :—

- (1) The text is very similar in style and scientific treatment to Chaucer's *Treatise on the Astrolabe* and contains what seems to be a direct reference to that work, which had been written and probably left incomplete and 'unpublished' only a few months before the date of writing.
- (2) A note, written in the main hand and drawn from one of the tables states that the year 1392 is the Radix of Chaucer. Such a planetary radix or root is used in the text of the *Equatorie* but not in the *Astrolabe*. Other examples are known of an author citing himself by name in a somewhat similar manner.
- (3) The hand of the text and of the "Radix Chaucer" note agrees quite well with that of a Public Record Office document which has been proposed as a probable Chaucer holograph. Superimposition of the two signatures shows dramatic agreement in spite of the interval of fourteen years in their dates of writing. It is however necessary to remark that there is much general similarity in all hands of this period, but no other Middle English MS. or Public Record Office document has been found to agree with the hand(s) so closely.
- (4) Linguistic analysis shows that, in the main, the forms in the *Equatorie* are those that appear in the best MSS. of the *Canterbury Tales*, and there are verbal echoes of the *Astrolabe* and a similar usage of many words, especially technical terms. One finds many words which are recorded elsewhere only in the works of Chaucer, and even more striking is the occurrence of many words which are given by New English Dictionary as first appearing in the *Astrolabe*. On the whole there is nothing in the language or style which is definitely against Chaucerian authorship, and many facts offer some support to the theory.
- (5) The author seems to have been living in London, but shows much influence from the Merton school of astronomy. Furthermore, he writes as an amateur rather than as a professional astronomer. He also seems to have been very familiar with the diplomatic cipher methods of his time. All these facts would be in good agreement with what we know of the life of Chaucer, and there is no other known person who tallies reasonably well in all these respects.

Scientific Content

The text describes in unusual detail the construction and use of a large instrument for calculating the positions of the planets at any given time. It is thus complementary to the better known astrolabe, which performs a similar function for the places of the stars.

* This analysis is being undertaken by R. M. Wilson, M.A., of Sheffield University.

The instrument is made from two discs, each 6 feet in diameter. One of the discs is solid, and its face is marked with the lines of apogee, and the equants, and other centres of the several planets. The other disc is a skeleton consisting of a ring, a diametral bar, and a rule pivoted at the centre of the bar. These two parts are pinned together and orientated in such a way as to simulate, to scale, the motion of each planet according to the Ptolemaic theory. Sets of tables are given for the two parameters used in the theory of each planet; these parameters are transferred to the Equatorie by means of a divided circle round the rim of each of the discs. The author says the large size is needed for good accuracy in calculation, and he sets an ideal of dividing (and therefore calculating) to one minute of arc, but with a 6 foot instrument one cannot expect better than about one-fifth of this precision.

The planetary tables in the volume are drawn from the Paris group of the Alphonsine Tables (ca. 1263–1272), and it is worth noting the spurious accuracy of using ten or twelve places of sexagesimals—it would correspond to about 1/1000 second in 1,000,000 years—which must be attributed to the fear (through ignorance) of any method of approximation. The development of the equatorium instrument is probably due to this same fear which made it undesirable to use approximations for calculation as had been done by Ptolemy in his “Handy Tables”; similarly medieval astronomers might well have preferred to determine a quantity such as $\frac{1}{2}\sqrt{3}$ by geometrical construction and measurement rather than by approximate calculation.

In conclusion, I note certain problems in connection with this MS. which are still unsolved and require attention more expert than the writer is able to give:—

- (1) The text opens, “In the name of god pitos and merciabile seide [leyk] the largere that thow makest this instrument—” The word *leyk* has been erased but is still visible in ultra-violet light. What does it mean? Is it a distorted transliteration of the name of the Arabic author of the source text? Costa ben Luqa (died ca. 912) seems too early for such an instrument, and no such writing by him is known.
- (2) The key to the cipher used by Chaucer (?) in certain comments on the use of the tables is as follows:—

v j ^ R o 8 9 6 2 7 W H 3 b y 3 0 i u ß n T O
 A B C D E F G H I J K L M N O P Q R S T ^{UV} W X Y &

Such keys usually follow some systematic arrangement so that they can be committed to memory and be reproduced at will. Is there any order to be found in these symbols? They do not seem to be all letters or numerals or Greek characters—do they correspond for example to any medieval concept of the Greek alphabet? Is the key based on some key-phrase or sentence such as a name or family motto?

- (3) There are many other Middle English scientific MSS. which have received little or no attention. Is there perhaps one which might correspond to the treatise on the ‘Solid Sphere’ which is mentioned in the Astrolabe (I. line 92, and I. conclusion 7, line 21. Ed. Skeat) and which would complete the possible trilogy of Sphere, Astrolabe, and Equatorie?

- (4) There are many Latin texts dealing with equatoria, but all of these describe smaller and less convenient instruments. Is there one which deals with the same type as that in the Peterhouse MS. or uses the Arabic terms *aryn* (as the cosmological centre of the universe, not the more common use as centre of the geographical world), and *alhudda* (=perigee).
- (5) Are there any manuscripts or documents of this period which are written in a hand similar to that tentatively identified as Chaucer's? It is desirable that searches should be made at Merton College, at the Public Record Office, and in collections of Middle English astronomy and Chaucerian poetry.