

From the *Transactions* of the  
Bristol and Gloucestershire Archaeological Society

**Remarks on an Astrolabe, belonging to F. A. Hyett, Esq., of  
Painswick House**

by R. Taylor  
1887-88, Vol. 12, 6-23

© The Society and the Author(s)

## REMARKS ON AN ASTROLABE

BELONGING TO F. A. HYETT, ESQ., OF PAINSWICK HOUSE,  
CO. GLOUCESTER,

By ROBERT TAYLOR, M.A.

I AM indebted to Mr. Hyett for an opportunity of examining an Astrolabe long handed down at Painswick House, and for permission to lay it before you ; I had desired to confine my notes to a detailed description to be inserted in the Society's Transactions, but yield to the authorities who think that the instrument would not receive the attention it deserves if it were not exhibited, and a paper on it formally read, at an open meeting : and I yield the more willingly in the hope that some of you may recognise some part of the instrument, and so bring to light others which are as little known as this was twelve months ago.

I must begin by clearing the character of my hero ; for whereas popular prejudice regards him as a rogue and a vagabond addicted to fortune-telling, he asks pathetically whether anyone has proposed to send the Astronomer Royal to the treadmill on the score of Zadkiel's misuse of his observations. "It is hard," says he, "that a gentleman of old family, who has always kept company with scholars, should be spoken of lightly by people who would not know him if they met him, and at best have only seen his name in Chaucer. And what does Chaucer say ? Does he degrade me, a personal acquaintance, by dragging me down to such uses ? No ; he protests he puts no faith in such superstitions, and only tells his son how pretenders map out the heavens as a matter of curiosity which may help him if, in his Oxford Local, he is called on to explain a literary allusion. The bulk of his instructions are how to find the time of day, of sunrise, of twilight ; how to measure altitudes ; to observe the motions of planets, and other like scientific learning. You moderns ought to look on me with respect, as a direct ancestor of the big telescopes and spectro-

scopes you are so proud of ; and not even me with a gipsy's cards all because a flighty barber in a story book would not shave Abou Kasim without taking liberties with one of my family." The old gentleman is quite right ; but I suspect he owes his birth to those same ignorant fortune-tellers : on the assumption that the heavenly bodies influenced the fates of men, in one position helping, in another hindering, was built a demand for accurate knowledge of these positions, and so arose a demand for instruments of accurate observation : and as the modern sextant is to the stick and knotted string, which native shipmasters in the east use to observe the altitude of the pole-star and so learn their latitude, so is the instrument now before you to the first device of immemorial antiquity, and again the great transit instrument of Greenwich to this. And I must further protest that the barber is not a figment of a story-teller's brain : Ferishta records with admiration the learning of Auveri Khan, who was challenged by Mahomed Sebuktageen to foretell the gate through which His Majesty would pass as he left Ghuzni that afternoon. The astrologer made observations with his astrolabe, and having finished his calculations, wrote his answer on a slip of paper which he placed under the cushion of the throne : at once the Emperor rose, ordered a breach to be made in the eastern wall, and through it departed for his ride ; but when in the evening he unrolled the paper, he found that this folly had been foreseen. I may add that the belief in astrology is as strong in the East as ever it was : any reader of Col. Meadows Taylor's memoirs will see that he was himself fully convinced of the power of men to read the future in the stars, the future even of small events in the lives of small men : all the important actions<sup>1</sup> of natives are controlled by the

<sup>1</sup> One of the publications of the Oriental Translation Fund gives the following passage from *Malcolm's History of Persia*, but without reference to the page :—

"Some years ago, when a Persian ambassador was about to proceed to India he was informed by his astrologer of a most fortunate conjunction of the stars, which, if missed, was not likely to occur again for some months. He instantly determined that, though he could not embark, as the ship was not ready which was to carry him, to move from his house in the town of Abusheher to his tents, which were pitched at a village five miles off to receive him. It was, however, discovered by the astronomer that he could

pretensions of astrologers, and I am told that when, for instance, intrigues against a Persian governor have been successful in causing his recall to Tcheran, the Shah himself is content to wait till the man's astrologer finds a propitious moment for him to obey the call, a moment generally delayed till friends and bribes at the capital have assured him a favourable reception.

Although I have prepared a minute description of the instrument before you on the lines of that given by Professor Skeat in his edition of Chaucer's treatise, which was published for the Early English Text and the Chaucer Societies jointly, I have preferred to compile my general notes from the less accessible work of Morley.<sup>2</sup> Though the instrument was certainly invented in the east, the name is as certainly derived from the Greek. "Astrolabes, as constructed by Mahommedans, may be divided into two principal classes, the spherical, and the superficial or or planispheric: the latter is based on the planisphere generally named after Ptolemy, but certainly the invention of Hipparchus. The uses of the astrolabe were manifold, but it was principally employed for taking observations of the sun, moon, and stars ;

neither go out of the door of his own dwelling, nor by the gate of the fort, as an invisible but baneful constellation was exactly opposite, and shed dangerous influence in that direction. To remedy this a large aperture was made in the wall of his house, but that only opened into his neighbour's, and four or five more walls were to be cut through before the ambassador and his friends (who included the principal men who were to accompany him) could reach the street. They then went to the beach, where it was intended to take a boat, and proceed two miles by sea, in order that their backs might be turned on the dreaded constellation ; but the sea was rough, and the party hesitated encountering a real danger in order to avoid an imaginary one. In this dilemma the governor was solicited to allow a part of the wall of the town to be thrown down, that a mission on which so much depended might not be exposed to misfortune. The request, extraordinary as it may appear, was complied with, and the cavalcade marched over the breach to their tents." It must be remembered that Abusheher, or Bushire, is far the most important port of Persia.

<sup>2</sup> Morley's description of a Planispheric Astrolabe (Williams & Norgate, 1856), consists of a learned disquisition on such instruments, a list of all which the author had been able to inspect, and proofs of the tables of a most beautiful Persian specimen, printed by the anastati process within the walls of the British Museum by permission of the trustees. If I rightly understood my informant, only one hundred copies were printed for distribution by the author.

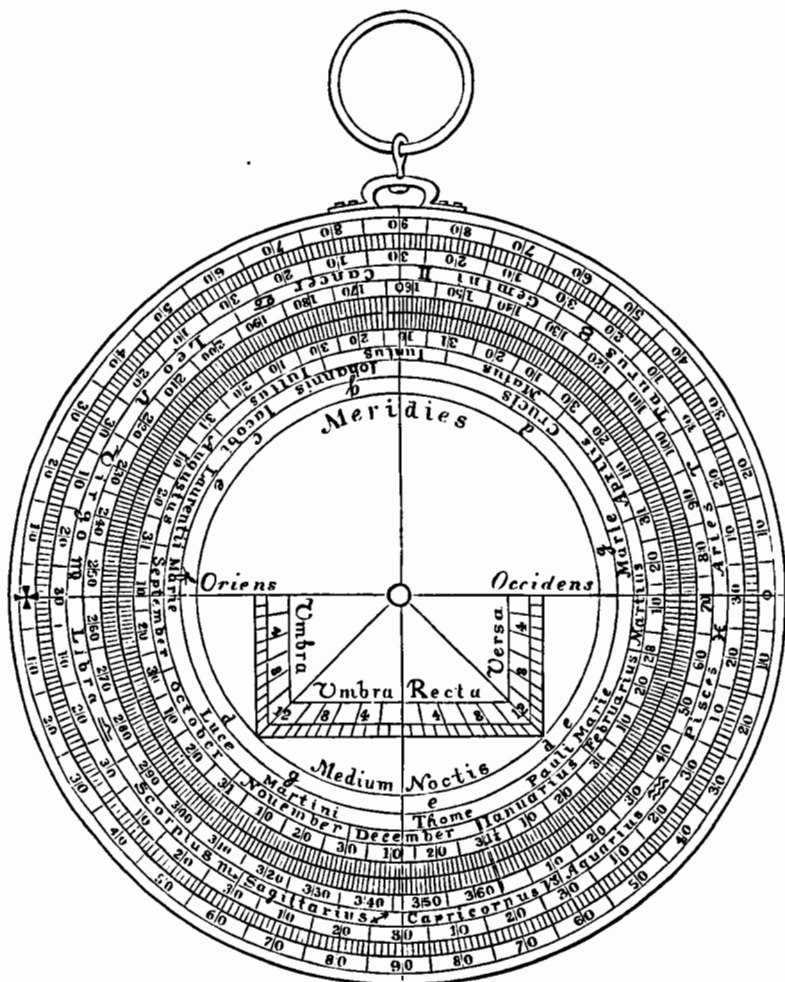


Fig. 1

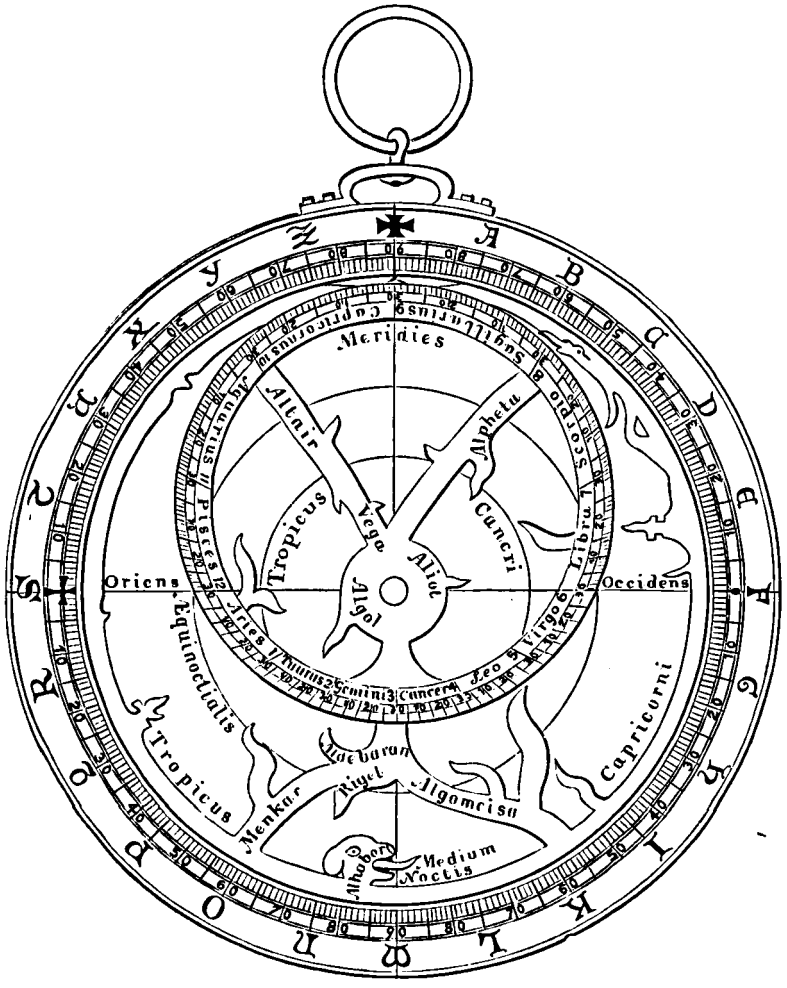


Fig. 2.

for measuring the heights of mountains and buildings, and distances generally ; for ascertaining latitudes, for the determination of time ; for the construction of horoscopes ; and for divers other operations connected with the sciences of Astronomy and Judicial Astrology. In Mahomedan Asia one of its chief uses was, and is still, the ascertainment of the exact position of Mecca as regards the place of the observer. In the east it retains its time-honoured pre-eminence among astronomical instruments, though it has passed from the hands of the man of science to those of the superstitious interpreter of the stars ;” into Europe, where it is now forgotten, it was introduced by the Arabian conquerors of Spain, but does not seem to have been in general use till the beginning of the fourteenth century.<sup>1</sup> In the middle of that century it must have been commonly employed ; the accurate construction of the two instruments in the British Museum, one bearing the inscribed date 1342, the other certainly not later, proves that the artificers who made them were perfectly familiar with the instrument : and the large number of works on the subject which issued from the earliest presses, and followed each other in rapid succession for 200 years after the invention of printing, attest the universal prevalence of the astrolabe during that period. And though it had undergone some modifications and improvements, the last century had commenced before it was completely superseded by instruments more perfectly contrived for similar purposes.

The essential parts of an astrolabe are : a flat heavy circular plate (the Mother) of metal ; rings whereby it may hang freely in a vertical position from the thumb of the observer ; the RETE (*Pl. II*), ANKABUT, net or spider, in front ; the IZADA or Rule (*Pl. III. fig. 3*) behind ; and a stout pin (*Pl. III. fig. 4*) passing from the back through the centres of all the pieces, and tying all together by a wedge in front of the rete. The front (*Pl. II.*) of the Mother has a rim engraved with hours and degrees, and on the wide space in the middle are arcs and circles suited to the latitude for which

<sup>1</sup> Skeat prints from MS. Cam. Univ. Lib. Hh. 6. 8, fol. 236—*Tabula stellarum fixarum que ponuntur in Astrolabio, certificata ad civitatem parisius cuius latitudo est. 48. gradus et. 30, Minuta. In anno domini nostri iesu christi 1223.*

the instrument is made; the back (*Plate I.*) has a Zodiacal calendar, and a band divided into degrees; the Rete (*Plate II.*) is a plane projection of the heavens within the tropic of Capricorn, the circle of the ecliptic divided into signs being conspicuous in the upper part; the Rule (*Pl. III, fig. 3*) is a straight-edge with fittings to help observation, is, in fact, the *alidade* of the French; and I may name here the Label (*Plate III. fig. 6.*) which seems to have been added in Europe.

It will have been noticed that I have spoken of only one variable portion, only the lines on the mid-space of the front have to be suited to the latitude of a particular place, and therefore for economy, that all this elaborate work may not be thrown away on one place, in most cases this mid-space was cut away so that in it might be lodged thin plates engraved with the lines suited to sundry other places, and prevented from turning with the Rete by a projecting tooth, which catches in an undercut hole in the rim; these plates are called by Chaucer, Tables. These tables (*Pl. III. fig. 5*) are engraved, first with the east-west (called the Horizon Rectus) and the north-south lines; next with circles for the tropic of Cancer, the equinoctial, and the tropic of Capricorn, the last close to the outer edge; the relations of these circles are the same for the whole world, and only change slightly at long intervals with the obliquity of the ecliptic: it is hardly necessary to say that, in describing an instrument made for the southern hemisphere, the words Cancer and Capricorn would in each case be interchanged. The other lines are suited to the latitude of the place: they are circles parallel to the horizon, shown more or less completely, called *almucántars*, or parallels of altitude; and *azimuths*, vertical circles which all pass through the zenith, and all necessarily cut the almucantars; the first of each of these groups passes through the points in which the equinoctial cuts the Horizon Rectus (the east-west line); the first almucantar is the Horizon Obliquus, the true or astronomical horizon which separates the upper from the lower hemisphere, so that all above it is visible at the place for which the table is constructed, and all below is hidden. The number of these circles marked depends on the size of the instrument; in the one before you azimuths are traced for every fifteen degrees, almucantars for every second.

Fig. 4

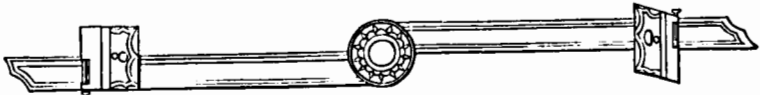


Fig. 3

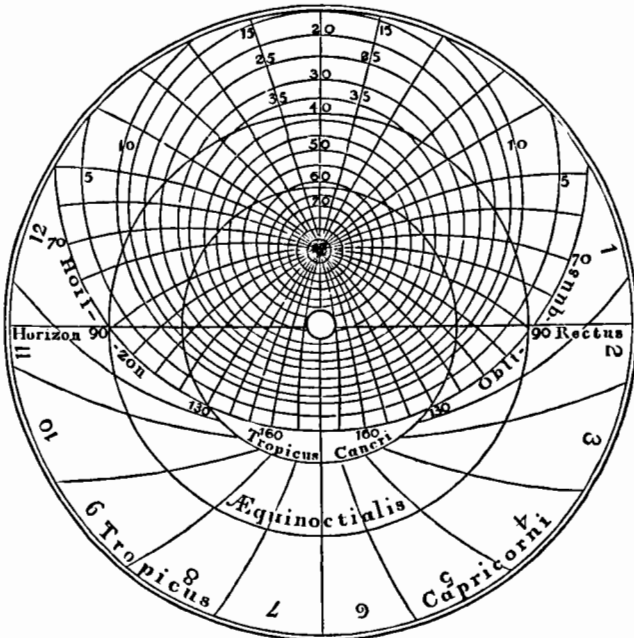


Fig. 5



Fig. 6

The Rete, the table which turns in front of the Mother, is the portion most likely to attract attention: I should describe it as a projection of the heavens north of the tropic of Capricorn, the less necessary portions being removed so as to expose the body of the instrument. The portions removed vary in different instruments; in all we find a round bit at the middle, through which the pin passes; the ecliptic with the signs of the zodiac, and a projecting tooth (the Almuri) at the summit; and the outer circumference, the inner edge of which represents the tropic of Capricorn: from the summit of this a small portion is cut away for obvious reasons. From different points of this frame-work project wavy tongues which indicate the position of sundry important stars, chosen after the judgment of the maker.

Last of all, I have to describe the Rule (*Pl. III*), *fig. 3*) which Morley considers to be "a necessary appendage of every Astrolabe"; it is a flat narrow rule extending across the back, with half the breadth cut away from each end, so as to leave for most part a straight-edge in the true diameter. "At either end is a flat rectangular plate; they are fixed parallel with each other at equal distances from the centre of the Izada, and at right angles to its plane of rotation. Through each of these is bored a hole, the one exactly opposite the other; or in some instances two, one (pair) very minute, the other, the upper of the two, somewhat larger; of these the lesser holes are employed for taking observations of the sun in the day-time, the larger for observing the stars at night. An anonymous Persian writer says that instead of the upper holes some workmen make notches in the tops of these plates, in which at the time of observation a small tube is fixed, the hollow part of the said tube being over against the said holes." I have made this extract from Morley (page 20), because I could not condense his matter, and further to draw attention to the upper notches, not holes, in my example, and to suggest that these, as also the upper holes in Morley's description, are for use as finders.

The Label (*Pl. III*), *f. 5*), the moveable pointer in front of the Rete, is like a very slender Rule without any sights. I cannot understand

how an observer could place his Rete in a position answering to that indicated by the Rule without the help of some such contrivance; yet Morley can have seen no Oriental astrolabe possessing it, for he holds that it was unknown in the East, and was an early European addition. The earliest mention of it he finds in a MS. of the thirteenth century in the British Museum, a translation of Messahala's treatise, in which it is called *novella*, without the addition of any Arabic name. He says that it sometimes extends only from the centre to the circumference, like the hand of a watch; I suppose he is here speaking on the authority of MS. representations, for it is not so curtailed in either of the two old European specimens known to him.

I proceed to describe the instrument before us, assuming remembrance of the general explanation given above, and following Professor Skeat's wording as closely as possible.

It is of brass, measures somewhat less than five inches in diameter, is a quarter of an inch in thickness, weighs nineteen ounces, and is in admirable preservation, with the unimportant exception of the original wedge.

The Back (*Pl. I.*), has eleven concentric rings; beginning at the outermost, the first two represent the 90 degrees into which each quadrant of a circle can be divided: thus the inner of the two is marked into 360 parts, the outer, for convenience of reading, into 72 only; on the outer ring, too, the numbers of degrees are inscribed, with this peculiarity, that whereas the N.W., and S.E., quadrants are numbered in tens, the other two start with 5, so running 5, 15, 25, and so on. The next two represent the signs of the zodiac, the inner marked into 12 spaces, each bearing the name of a sign, full or abbreviated, in gothic characters; the outer into 72, so allowing 6 to each sign; the degree-marked circle, which lies next outside, serves to give the 30 degrees which pertain to each.

The next ring is blank, save that the lines dividing the months on the inner circles are carried across it. Then come a ring divided into 365 spaces for the days of the year; a ring divided primarily by the long lines just mentioned as parting the months,

and also by inner spaces marked 5, 15, 25, to facilitate observation of the day; and a ring bearing the names of the months, with the usual contractions; the long lines above mentioned parcel off to each month its own number of days, to February 28 only, nor is there any provision for showing the intercalated day, either as a whole, or by division of the day-circle into  $365\frac{1}{4}$ <sup>1</sup> parts, as in the figure given by Skeat from Metius' Dutch plate. The innermost three rings gives the names of certain festivals, three for each month, the date of each, and the Sunday letter for that date. On the central space are the scales of Umbra Recta and Umbra Versa, each divided into 12 equal parts; the parts are numbered, but neither the scales nor the points of the compass are named, nor the north-ward line engraved.

The other side of the plate, called the Front (*Pl. II.*), has a rim three-eighths of an inch broad, with a wide depression in the middle; the rim is marked with three rings or circles, of which the two inner show the degrees of the quadrant, while the outermost is divided by 23 gothic capitals, and a small cross above the south line, so shewing the 24 equal, or clock hours; midway between each pair of letters is a quatrefoil, but seemingly for ornament only, as it does not mark the middle of the hour space as accurately as the letter does the end. The middle of the Front is plain, but into its hollow drop three Tables, engraved on both sides, each side bearing the name and latitude of the place for which it was suited: no other word appears on the face, nor are the almucanters numbered in exactly the same way on all, though the purpose served is the same; the lower part of each is divided by lines marking the twelve planetary hours. The pairs of places are London 52, and Berwik 57; Coloina 49, and Paris' 59; Roma 42 and Tholet' 40; the Tables which shew most signs of use are those of London and Cologne. The only one calling for any remark is that second, on which the latitude of Cologne is mis-stated by nearly 2 degrees (49° instead of 50° 55'), while on the back the name is read by everyone Parisi', though it is certainly constructed for a place of the latitude named; it is for the ninth climate, of which

<sup>1</sup> I suspect that Metius put this quarter space out of his own head, not after any instrument.

the latitude is taken as for the Orkneys, *Insula Tyle* as I find it in one list.

The Rule and Label are both finished very neatly and with great accuracy. The sights of the Rule are fixed, not folding as in Skeat's description, each with a square notch above and a pin-hole below. The thumb ring, the " turet " which links the thumb ring to the Mother, and the neat pin are all in place ; in fact nothing is missing but the Wedge, which passing through the pin, held the parts together.

On the Rete twenty-one stars are marked ; it is not worth while to give a list of the sixteen named as all are to be found in Skeat's lists, and still less to record my conjectures as to the five un-named.

To us, as members of an Archaeological Society, perhaps the most interesting point about my hero will be his probable antiquity, and we shall be apt to follow in Sir George Lewis' track of wholesome disbelief of certificates and family bibles ; but, if you could suspect a lump of solid brass of such a pitiful ambition as overstating its age, it is satisfactory to be assured that it carries its birth certificate on its face, or to speak more accurately on its back, where on adjoining concentric circles are shewn the days of the year, and the degrees of the corresponding signs of the zodiac. Now spring is said to commence at the moment when the sun's apparent path enters Aries, of which the first point is on the terrestrial equator ; this passage will be repeated at an interval of  $365\frac{1}{4}$  days, and so, if it were not for the correction of the intercalated day in leap year, this event would seem to take place later by a day every fourth year, and every astrolabe would shew the period of four years in which, and for which, it was constructed. This error is corrected by the intercalated day, but unluckily it is corrected too much ; the true year is less by  $11' 10''$  than the time I have given, and if you like to check my calculation by a pencil and paper, you will find that this error accumulates to the extent of a day in 130 years, or to speak more accurately to 3 days, 2 hours, 26 minutes in four centuries. The larger correction of the calendar was, we all know, introduced by Julius Cæsar, the lesser was neglected till it had led to inconvenience, and was set right by the Gregorian reform in

the sixteenth century, which was only followed by ourselves in the middle of the last century, and is still stoutly resisted by Russia. Now Chaucer tells us that when he laid the rule of his Astrolabe against the line of mid-day (the commencement of the astronomical day) of 12th March, 1391, he found the point of it "in the bordure upon the first degree of Aries, a litle within the degree:" an instrument 130 years older would have given this result for 13th March, one more modern by as long a period would have given it for 11th March; repeated trial makes me confident that in the instrument before you the mid-day line of 12th March agrees exactly with that which marks the end of the first degree of Aries, whence I should infer that it is somewhat earlier in date than Chaucer's.<sup>1</sup> The stars shown on the Rete afford material for another test, by means of which Mr. Godfray fixed the date of that preserved in the library of King's College, Cambridge, for 1540; the operation would be a delicate and difficult one, even to a skilful astronomer; besides Chaucer is careful to put in a caveat about the rete, that it "conteinith certain nombre of sterres fixes, with hir latitudes and longitudes determynat; if so be that the makere have nat erred," as in such delicate work in more than easy.

Next you will ask me where the instrument was made. You will remember that on one ring of the back, 36 festivals are named; 16 are red-letter, 15 black-letter, and 5 not known to our modern use; as 5 of the black-letter, and 2 of the other are distinctively English, I answer with confidence that it is of English manufacture. As I should be glad of any conjecture as to the principle underlying the choice of names, I will give a full list, italicising the English ones; but I use modern spelling, partly because I do not wish to be tied to the engraver's abbreviations;

<sup>1</sup> To avoid misunderstanding, it is as well to say that, to me, "the sun's entry into Aries," "the first point of Aries," are the point dividing Pisces and Aries; "the first degree of Aries" the line which marks the end of the first degree measured from that point. "The first point of Aries" in this instrument seems nearly mid-way between the noon-points of 11th and 12th March; it is easy to be a little wrong in making, or in reading, divisions so small that the thickness of the dividing line makes a difference; in this instance the two sets to be compared have respectively 365 divisions in a length of 10.5 inches, and 360 in a length of 13.5.

even as to the intervals there seems to be no principle, for, whereas for any practical use one would expect them to be chosen at pretty regular intervals, *e.g.* 5th, 15th, 25th, 5th is not chosen at all, 15th once only, but 25th six times.

JAN. 1st Circumcision, 6th Epiphany, 22nd Vincent ; FEB. 2nd Purification, 10th Scolastica, 22nd Chair of Peter, (in Antioch;) MARCH 2nd *Cedde*, 12th Gregory, 25th Annunciation ; APRIL 4th Ambrose, 19th *Elfege*, 25th Mark ; MAY 1st Philip, 19th *Dunstan*, 25th *Aldhelm*, (of Malmesbury and Sherborne) ; JUNE 11th Barnabas, 22nd *Alban*, 29th Peter ; JULY 7th, *Thomas*, (of Canterbury, Translation) 20th Margaret, 25th James ; AUG. 10th Laurence, 15th Assumption, 24th Bartholomew ; SEPT. 8th Mary, (Nativity), 21st Matthew, 29th Michael ; OCT. 9th Denys, 18th Luke, 28th Simon ; Nov. 11th Martin, 17th *Hugh*, (of Lincoln), 25th Katherine ; DEC. 8th Conception, 21st Thomas, 25th Nativity. What, I ask, is the guiding principle? Why in January is Vincent chosen rather than more notable names around him? Why in May *Aldhelm* rather than Augustine of Canterbury who is commemorated on the next day? Why in July Margaret rather than Swithin whose day divides the interval between the other two somewhat better?

It may be expected that I should illustrate this list from those on other instruments; but, though Chaucer seem to know none not so calendared, and Skeat's MSS. seem always to show them, I have found festivals noted on one other only, the great one in the Sloane Collection, from which I annex a list on the same principle, but omit the name of a festival already named above. JAN. 1st, 6th, 13th Hilary, 22nd, 25th Paul ; FEB. 2nd 14th Valentin, 22nd, 25th Matthias ; MARCH 12th, 21st Benedict, 25th ; APRIL 4, 14th Tiburtius, 25th ; MAY 1st, 3rd Holy Cross, 6th John, (ante Portam Latinam), 19th, 26th *Augustine*, (of Canterbury) ; JUNE 11th, 24th Baptist, 29th ; JULY 4th Martin (Translation), 20th, 25th ; AUG. 1st Peter (ad vincula), 10th, 15th, 24th ; SEPT. 1st, Giles, 8th, 14th Holy Cross, 21st, 29th ; OCT. 1st Remigius, 9th, 18th, 28th ; Nov. 1st, All Saints, 11th, 20th *Eadmund*, 25th, 30th, Andrew ; DEC. 6th Nicholas, 13th Lucy, 21st, 25th. Here we have the names of 48 festivals, of which 28 appear

on the instrument before you, but only one of the 28 is that of an English saint ; of the new 20 only two are English ; *i.e.* in all, 3 out of 48 against 7 out of 36 ; yet this also is of English manufacture, as may be inferred from the fact that the only table engraved for a named place is that of London. In this list there is the same puzzle from the occurrence of such names as Vincent, Margaret, Denis and Katherine.

So it was made in England ; can I draw the net any tighter ? Obviously it is not of the Northern Province, for though one table is for Berwick, no one of the commemorations is distinctively northern. There are two peculiarities from which I had hoped for some clue ; Alban is commemorated on 22nd of June, instead of 17th as in our Prayer book ; and against March 2nd is named, instead of Chād, his elder brother, a successful missionary from Northumbria to the Middilangli, the Angles of the old diocese of Leicester, the patron of a monastery near Whitby over which he set Chad, Bishop in Essex, and recorded among the Bishops of London ; I therefore wrote for instruction to the Rev. Dr. Littledale and to the Rev. Baring-Gould, both of whom replied with courteous promptitude. The former destroyed my hopes from Alban by telling me that there had never been any difference of use, that he was always commemorated on 22nd of June, though his name is now set against 17th through a misprint of xvii for xxii. He also tells me that the festival of Cedde of London was on Jan. 7th, and would thence infer that the instrument could not have been made in London ; Mr. Baring-Gould would assign it to a workman in the east of England, Lincolnshire or Essex, evidently because these were the scenes of Cedde's work, and the places where he is most likely to be held in reverence ; and I think, for myself, I should reverse Dr. Littledale's argument, and say that the workman, finding in his pattern the unfamiliar spelling Ceadda, amended it to Cedde without noticing the disagreement of date. Is any hint given by the occurrence, on an instrument made in London, of the names of the one Archbishop of Lichfield, a saint so purely western as Aldhelm, and one so little known as Scolastica, sister of Benedict ?

Would it be ridiculous to conjecture that the instrument before you was made in London, to the order of a native of the diocese of Lichfield, who had entered the Order of St. Benedict, and held office in Malmesbury or a dependent cell?

Now as to the rarity of such an instrument; how many astrolabes, of English manufacture, of the fourteenth or fifteenth century, can we find? Very few, and it is wonderful that they are so few: as Morley points out, the skill displayed in the fabrication of the few we have, and the mass of literature bearing on the subject, evidence the large demand for them, though I do not know that one is mentioned in any will of these centuries; Chaucer's treatise shews that an astrolabe was no more out of the way in the equipment of the son<sup>1</sup> of a professional man than a gold watch would be now; and the allusion to the hour in the *Man of Lawes' Prologue* goes to show that a well-to-do innkeeper<sup>2</sup> may well have carried one. What then has become of them all? I fear the melting pot must answer the question; I do not believe that one was laid aside only because it had ceased to shew correctly the moment of the sun's entry into Aries, but that, being laid aside as no longer needed for practical purposes, it fell

<sup>1</sup> What was the age of "Litell Lowys my sone"? Chaucer's latest biographer (Professor Hales in the *Dictionary of National Biography*) says that "in 1391 Chaucer's son seems to have been just ten years of age" if he was already at Oxford, or if he was to understand this treatise addressed to him by name, he must surely have been older; would it be too much to suggest that he can hardly have been less than fourteen?

<sup>2</sup> If it were not for the distinct mention of the "degree Phebus was clombe on highte" I should have been tempted to ask if "oure hoste" did not use some portable sundial rather than an astrolabe, some such instrument as is described under 1849a of the catalogue above referred to. "This was found about 25 years ago in a stream in Tillington parish, 3 miles from Petworth, whilst digging for the foundation of a bridge, and may be described as a ring of copper about 1·5 inches in diameter, on the outer side of which are engraved letters indicating the names of the months with graduated divisions, and on the inner the hours of the day. In the inner slide there is a small hole which must be made to correspond to the month in which it is used. The circle is held up to the sun, the inner surface is then in the shade and the sunbeam, shining through the little orifice, forming a point of light upon the hour marked on the inner side. In Knight's *Pictorial Edition of Shakspeare, 'As You Like It,'* p. 231, is a representation of a similar instrument." For the opportunity of consulting this catalogue I am indebted to Mr. Lewis Evans, of Hemel Hempstead.

into the category of old metal and so perished. Morley had seen two, both in the British Museum; I add this one, and three at Merton. I am told that one at Oriel resembles the finest at Merton. I find in the catalogue of scientific instruments shewn at South Kensington in 1876, one of A.D. 1374, which may be English, and I know no more; of course a dozen more may lie hid in country houses, just as this did last year, and we should be glad if this paper should fall into the hands of their possessors and so bring them to light.

For the convenience of future enquirers, it may be as well to describe briefly the instruments I have seen, which are of a date older than the Tudors, and presumably of English manufacture.

Through the kindness of Messrs. Franks & Read, I have been allowed to examine the two old ones in the British Museum; I have not done justice to their help, for I cannot speak with confidence of the position of the first point of Aries; I give it from my notes but under reserve:—

(A) The great Astrolabe, from the Sloane collection in the British Museum, measures 18·25 inches in diameter, and weighs some 30 pounds; it has three tables, for 48·30 (*i.e.* Paris) and 51, 45 and 53, 52 *Lundoniarum* and 55; the last named is the most exposed: on the other are the lines for 42. I omitted to note the number of stars on the elegant rete; the ornament on the surface of the instrument is very good, and suited to the period which Mr. Franks would put as 1280, though Morley had assigned it to 1340; the sun enters Aries on 14th of March. I omitted to note the extent to which the instrument is defective; the parts are kept together by a modern nut and bolt.

(B) was given to the British Museum by Mr. Mayer, of Liverpool, to keep the first named company. It is perfect save for want of the wedge, and I think the central pin is also modern; the mother is blank inside; the one finished table is for 51° and 52°; the mother has only the three fixed circles engraved; it measures 8·5 inches in diameter, has 37 stars on the rete, and bears an

inscription: "*Blakenei me fecit Anno 1342.*" According to my note the sun enters Aries on 13th March.

Through the kindness of Professor Wallace I have examined minutely the very curious group at Merton, and have made the careful rubbings which I now exhibit: they would serve to help calculations rather than observation.

(C) is the most curious instrument it has been my fortune to see; and as no verbal description can do it justice, I should like to see it reproduced by the anastatic process, in order that its uses might be fully discussed. It consists of mother, rete and label; measures 14·5 inches in diameter; weighs 3 pounds; and now shows only 36 stars on the rete, several tongues having been broken off. The point of suspension is opposite to the first point of Aries, which answers to something before the noon-point of 12th March; fixed sights are soldered to the edges at points distant  $40^{\circ}$  to  $45^{\circ}$  from that of suspension. The border has six bands; counting from the outer edge, the first and fifth have lines turned on them apparently, for ornament; the second has certain notes; the third and fourth give the months with their days, and the signs with their degrees; and the sixth is divided into five-degree portions, which are numbered in Arabic numerals to be read from the centre; thus this border contains the essential parts of the back of an ordinary instrument, and the back is left free for other uses. This, then, has an outer circle for the zodiac, divided into degrees, within which, and touching it at the first point of Cancer, are two other circles, not concentric, marked into  $360^{\circ}$ , as also are four other circles lying detached within, and marked *Jupi'*, *Mercuri'*, *Mart'*, *Saturn'*. Against the first point of Cancer I read *Aux Sol' benign'* and on the same side a table which seems to give the allowance to be made for the precession through the century beginning with 1350, and two small circles without inscription, and sundry notes of a word or two. As the face bears the inscription: *Lat'. 52·6<sup>m</sup> Oxonia*, and as the indications of date, deduced from the first point of Aries and from the table of precession, are suitable, I would conjecture that the instrument was made for a Merton man in the middle of the fourteenth

century, perhaps even for Ashindon or Rede, perhaps at Oxford, under his own eye, as I should suppose to have been the case with the quadrant mentioned below.

(*D*) is a rough instrument weighing 6 pounds, and measuring 9·75 inches. It has tables for six of the seven climates, one for Londonie being substituted for the second ; it has no rete or label, but a flat disc, (to the middle of which is soldered the pin which goes through the whole) with a projecting finger ; the edge is divided into spaces numbered 1 to 29, each sub-divided into quarters, but, as a half-space is left between 29 and the beginning of 1, the sub-divisions are 118 in all : the finger projects from the first point of 1. These sub-divisions make it clear that this instrument was intended for lunar calculations. The first point of Aries is in advance of the noon-point of 12th of March ; the characters on the back are handsome Gothic, those on the tables I take to be rather Longobardic. There is, of course, no indication the place of manufacture, but I suggest that an instrument, made with a complete set of tables for general use, has been made suited to English handling by one face of a table being polished, and re-engraved with the lines suited to London.

(*E*) is a puzzle, and deserves re-production by the same process as (*C*). It is  $6\frac{1}{8}$  inches in diameter ; the first point of Aries is opposite 11th March. The outer edge is divided into five-degree portions by holes drilled through ; next, three bands give the degrees and their numbers, and the names of signs ; next, a band with the names of months strangely placed, Jan. being opposite the 29 of Pisces, numbers chosen on no intelligible plan flank the names ; then three bands, the inmost shows the names of months, now in their proper position as regards the zodiac ; the middle the days of each month numbered by fives ; the outer single days : inside all, another circle of numbers, 0 opposite the first points of Aries and Libra, 24 opposite the first points of Cancer and Capricorn, and between these 17 other numbers, some repeated, more omitted : these inner circles are not true. In the middle is a disc labelled Sol, with the edge divided into 30 spaces,

N.B.—It is worth notice that the names of some months are given in an abbreviated form, 7ber, 8ber, 9ber, 10ber.

and a finger projecting as far as the edge of the plate; above it moves, pivotted to the same centre, a finger labelled 'Luna,' which also reaches the outer edge. On the back is a human figure ornamented with the signs of the zodiac, each on the part which it is supposed chiefly to influence in the scheme traced back to the ancient Egyptians.<sup>1</sup> It will be observed that with this was no tables, rete, or rule, suspensory apparatus, or sights, and I incline to regard it solely as a table for calculations.

I cannot deny myself the pleasure of describing another most curious instrument at Merton, a quadrant of 12 inches radius, which from the lettering I should suspect to be the oldest of all, a conclusion in harmony with the fact that in the table of months and signs on the back the first point of Aries answers to 13th March; the other side has curiously arranged bands giving all the signs, and the edges are so graduated that degrees and their numbers are to be read in any position of the instrument. I suspect that it is not finished, for though seven stars are named, there are blank guide-lines for the names of four more. These instruments are the more interesting from the ancient fame of the college for astrological learning. It is said that the Black Death was foretold by two of its members, John Ashindon and W. Read; the latter, afterwards Bishop of Chichester and founder of the library, compiled astronomical tables of which copies are preserved in other colleges, though probably lost to Merton in the great destruction of the sixteenth century; from the former Antony Wood dates a succession of mathematical students extending over at least 150 years.

What is the conclusion of the whole matter? It is that the instrument before you is one of an extremely rare class; that no specimen is in better preservation, if any be in so good; that it answers, as no other does, to the type described by Chaucer; and is adapted, as no other is, to practical use: Blakeney's, its nearest rival, must expose nearly three times as much surface to the wind, and must weigh nearly three times as much, an important point when an instrument has to be observed as it hangs on the thumb of the operator; it has tables for but two instead of six latitudes;

<sup>1</sup> Encyclopædia Britannica, sub voce Astrology.

is no more certainly English than the other, for the saints named are no less certain evidence than the name of the maker; in antiquity, I take it, Blakeney has the advantage by some years.

Through the kind intercession of Professor Skeat, the Early English Text Society has favoured me with permission to make use of some of the blocks prepared for his edition of Chaucer's treatise; they serve to illustrate my paper as well as the most careful reproduction of the instrument before you.

#### DESCRIPTION OF THE PLATES.

*Plate I. fig. 1.* The flat back of the Astrolabe.

*Plate II. fig. 2.* The front of the Astrolabe, with raised border.

In the wide depression in the middle, the plate called "Rete" is dropped in, and is shewn in its primary position. The principle lines are shown as engraved on the body, but not that of almucantars and azimuths: these would be seen through the openings cut in the rete.

*Plate III. fig. 3.* The "Rewle" carrying two sights, which revolved at the back of the Astrolabe.

*fig. 4.* The central "Pin" shewn with the "Wedge" inserted in it.

*fig. 5.* One of the Tables or Discs, used by being dropped within the depression on the front of the Astrolabe. They were marked differently, according to the latitude of the place; the one here drawn is suitable for the latitude of Oxford, nearly.

*fig. 6.* The "Label" which revolved at the front of the Astrolabe.