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Between Astronomy and Astrology: Chaucer's "Treatise on the Astrolabe" and the Measurement of Time in Late-Medieval England

Stefania D'Agata D'Ottavi

Chaucer's *Treatise on the Astrolabe* is analysed from the point of view of the language of scientific writing and of the very young age of the addressee. Chaucer is argued to have used a sort of language that strives for the rigour of scientific discourse while still being aimed at a young pupil who does not know Latin and is evidently at the beginning of his school training. Moreover, the fact that the schoolboy is introduced as the writer's son gives the language a particularly intimate tone; the father takes pains to make his explanations clear, and attempts to arouse the child's interest in a difficult subject. Another work also probably addressed to a young student, Richard Billingham's *Speculum puerorum* is compared to Chaucer's treatise with respect to tone and choice of subject. I argue that, in spite of the many differences between the two works, Billingham's logical treatise may have aroused Chaucer's interest and provided a model for his own work; there are some similarities between the carefully clear propositions which characterise both texts and which appear to be the result of both authors' concern for a pedagogical approach to scientific subjects, where equally difficult problems have to be explained to young students and their complexities made understandable and interesting to small children.

In Chaucer's *Squire's Tale* magic mainly serves the purpose of emphasising the idea of change – a *leit-motiv* in Chaucer's poetic production – in order to give it literary form. The four objects the ambassador from "the

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king of Arabe and of Inde" (l. 110) offers King Cambyuskan as a birthday present, the brass horse, the mirror, the ring, and the sword, all seem to give the king some sort of power over the natural world, and this is also, I think, what relates the first part of this fragmentary tale to the second with the story of Canacee and the falcon, where the magic ring allows the hawk to win back the *tercelet*'s love, thus transforming an unfaithful lover into a faithful one. But it is the brass horse, the most impressive of the gifts because of its aspect and the extraordinary powers it is apparently endowed with, that is interesting for our purpose:

This steede of bras, that esily and weel
Kan in the space *of o day natureel-*
This is to seyn, *in foure and twenty houres-*
Wher-so yow lyst, in droghte or elles shoures,
Beren youre body into every place
To which youre herte wilneth for to pace,
Withouten wem of yow, thurgh foul or fair;
Or, if yow lyst to fleen as hye in the air
As dooth an egle whan hym list to soore,
This same steede shal bere yow evere more,
Withouten harm, til ye be ther yow leste,
Though that ye slepen on his bak or reste ,
And turne ayeyn *with writhyng of a pyn.*
He that it wroghte koude ful may a gyn.
He wayted many a *constellacion*
Er he had doon this operacion,
And knew ful many a seel and many a bond.
(*The Squire's Tale* 115-131) [italics mine]

Magic horses – from Pegasus onwards – are well-known in literature, but this one, connected as it is to the manipulation of space and time, seems to be something more than a complex mechanical toy for the king to amuse himself with. It has been suggested (Osborn 34) that the way it is described, besides recalling ancient stories about flying horses, can also allude to the main instrument that during the fourteenth century allowed people to calculate the hours of the day, the days of the week and the sequence of the months in the year and to position the sun in the "houses" of the individual planets, thus providing further astrological information. This instrument – the brass astrolabe – was capable of accounting for and measuring perhaps the most important kind of change occurring in nature, that is, the passing of time. It was first used in ancient Greece (its name means "star catcher" or "star holder") and became more and more accurate and complex thanks to the work of Arabic astronomers. In Western Europe it soon established itself as the main and most versatile instrument for the measurement of time.

An astrolabe was a planispheric projection of the celestial sphere, an imaginary sphere the centre of which was made to coincide with the earth's centre. It consisted of a circular plate (usually in brass) called the "mother," with a diameter of about seven inches. The back side was flat and each quadrant of the circle was divided into ninety degrees in order to allow the measurement of the altitude of celestial bodies. Inside the rim there were the twelve signs of the zodiac, each divided into thirty degrees. The days of the year were represented in the two circles inside the first, while the next three bore, respectively, the names of the months, the number of days in each of them, and the smaller divisions that represented each day. The two innermost rings indicated the saints' days and their Sunday letters, that is the letter upon which the first Sunday of the year fell. The scales of *umbra recta* and *umbra versa*, each divided into twelve equal parts, were designed to calculate the length of the shadow of an object (Skeat xxxiv) (see Figure 1). In the *Introduction* to the *Man of Law's Tale* this method is clearly indicated:

> Oure Hooste saugh wel that the brighte sonne
> The ark of his artificial day hath ronne
> The ferthe part, and half an houre and moore,
> And though he were nat depe ystert in loore,
> He wiste it was the eightetethe day
> Of Aprill, that is messager to May;
> And saugh wel that the shadwe of every tree
> Was as in lenghte the same quantitee
> That was the body erect that causeth it.
> And therfore by the shadwe he took his wit
> That Phebus, which that shoon so clere and brighte,
> Degrees was fyve and fourty clombe on highte.
> (1-12).

The front side of the astrolabe had a rim with three circles, namely the circle of letters (from A to Z) representing the twenty-four hours of the day, the Tropic of Cancer, the Tropic of Capricorn and the line of the Equinoxes (which Chaucer calls the *Aequinoctialis*). A number of circular plates could be superimposed on the "mother." The most important was called the *rete* (net) and was essentially a star-map (see Figure 2). Other circular plates called *climates* indicated the various latitudes (see Figure 3). The stars could be seen through holes in a pair of vanes placed on a straight rule (see Figure 4). A pin was made to slide through the centres of all the plates to hold them together and was secured by a

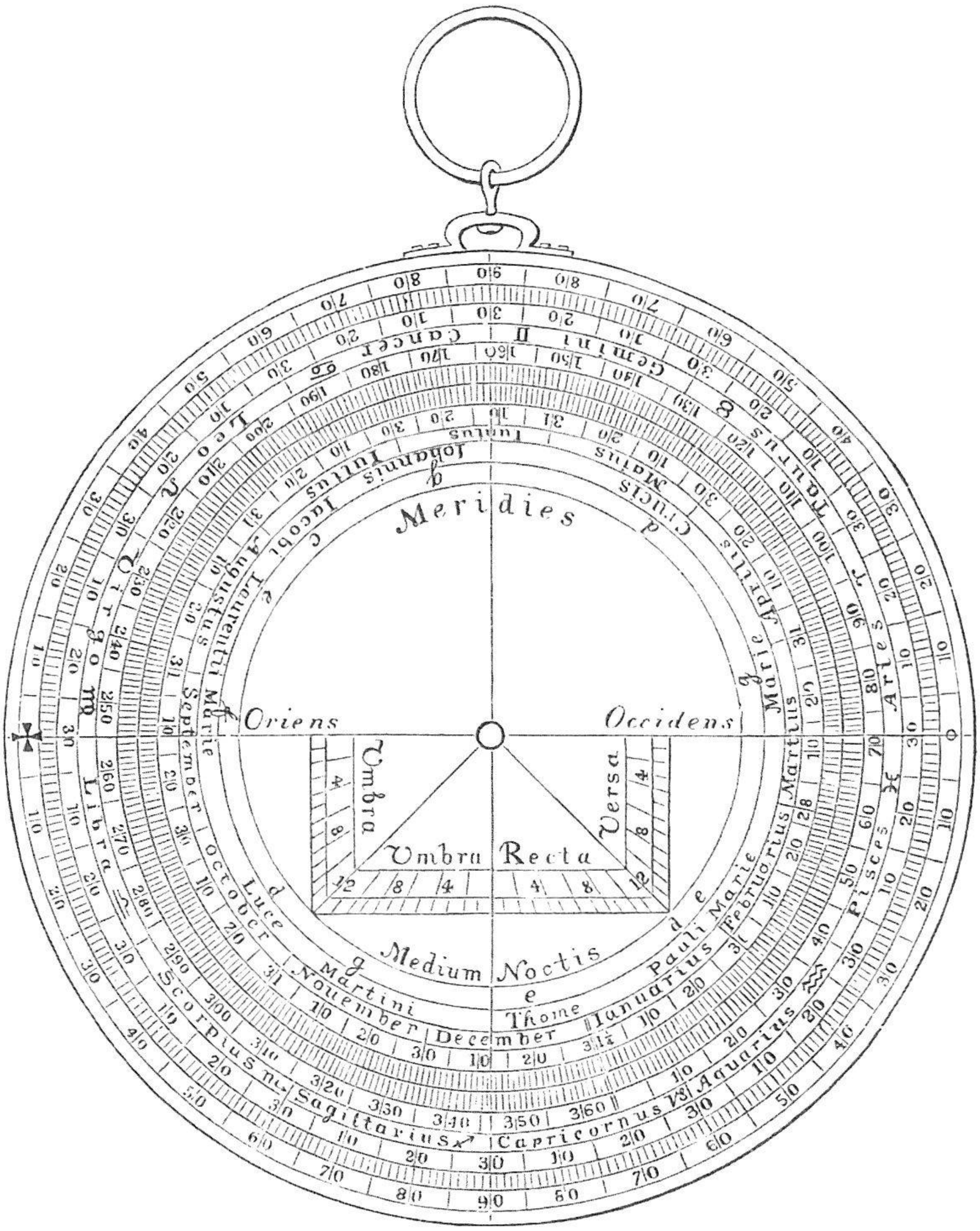

*Fig. 1**

The flat back of the Astrolabe

* The figures and the captions are from Skeat's edition of Chaucer's *Treatise*, and are here reproduced by kind permission of the Council of the Early English Text Society (EETS)

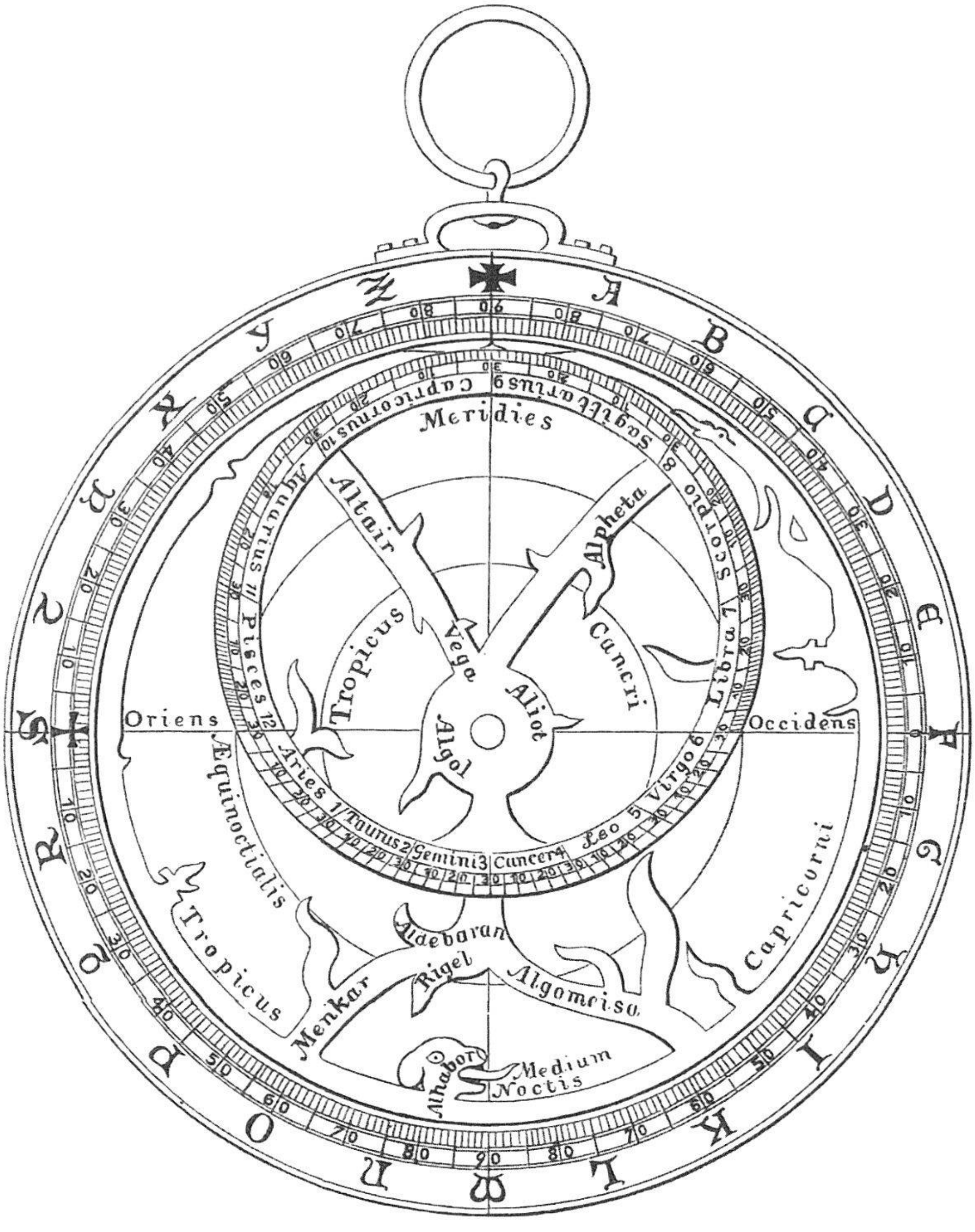

Fig. 2.

The front of the Astrolabe, with raised border. In the wide depression in the middle, the plate called the "Rete" is dropped.

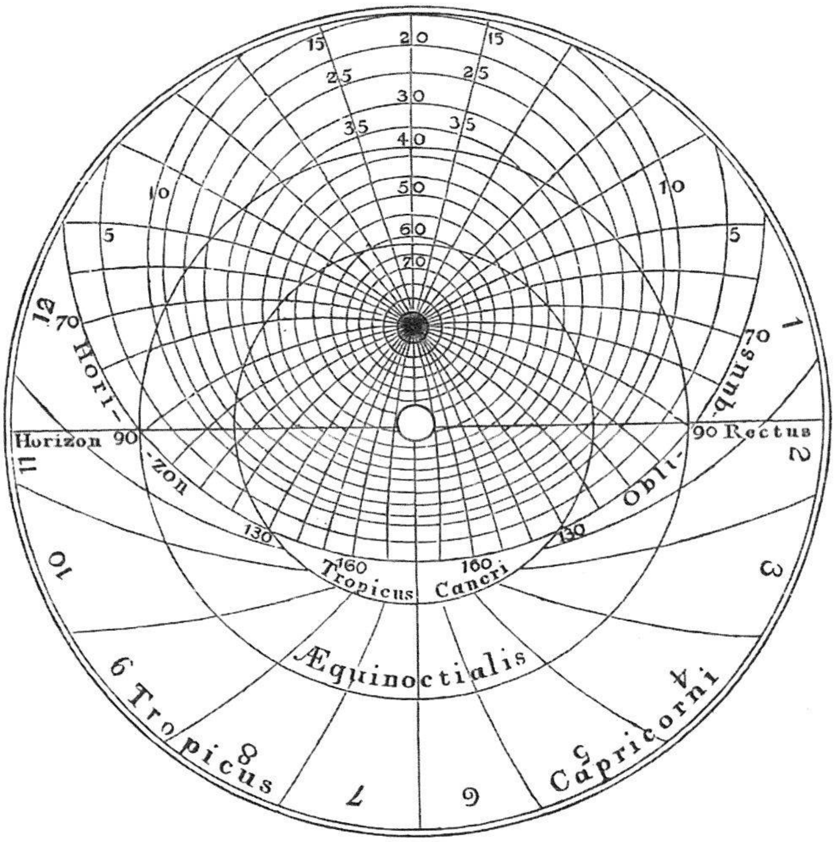

Fig. 3

One of the discs, used by being dropped within the depression
At the front of the Astrolabe

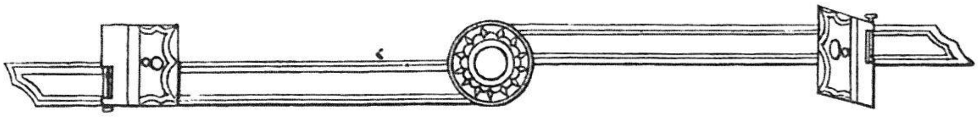

Fig. 4

The Rewle (alidade), carrying two sights,
which revolved at the back of the Astrolabe

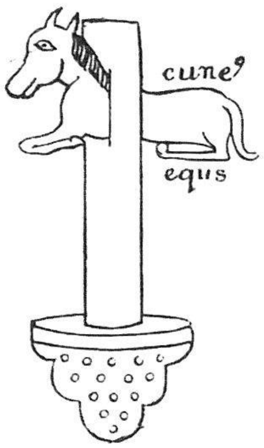

Fig. 5

The wedge cut into the shape of a horse.

wedge the head of which was often in the form of a horse's head and was therefore called "the horse" (Skeat xxxv) (see Figure 5).

If we now go back to the brass horse King Cambyuskan was given as a birthday present, we can see how it can metaphorically represent an astrolabe. In the words of Marijane Osborn, "The evidence mounts for a carefully contrived three-way correspondence between the steed of brass, the horse-shaped wedge of the astrolabe, and the position of the Sun on the king's birthday. . ." (Osborne 52). Moreover, the expression "day naturel" is exactly the term Chaucer uses in his *Treatise*. It indicates the division of the day in twenty-four hours of equal length, a way of measuring time that was becoming more and more important with respect to the older way, called of "unequal hours." The magic horse can take the king anywhere without harm in good as well as in bad weather and it will "turn again with the writhing of a pyn" (l.127); moreover, the craftsman who built it has observed "many a constellacion" and perused a lot of documents, that is, examined many charts. In presenting the king with a magic horse, the ambassador of the "king of Arabe and Inde" is giving him some sort of hegemony over time and indirectly over space, as well, thus allowing him a kind of control similar to the one that could be acquired by means of an astrolabe, where the measurement of time was performed by calculating distances on the projection of the celestial sphere.

Between the thirteenth and the fourteenth centuries, astrolabes were slowly replacing other instruments of measurement of time, such as sand glasses or water clocks, sun-dials, or even church bells. With the passion for fanciful etymologies the Middle Ages always show, John of Garland says that "Campane dicuntur a rusticis qui habitant in campo, qui nesciant judicare horas nisi per campanas" (Le Goff 123).[1] The need for a more sophisticated kind of time measurement was essentially due to two elements: one that I shall call "practical" – but which had also important general implications – and a purely theoretical one that concerned the nature of time and the meaning that could be given to the term "measurement." The transformation of medieval society from an almost exclusively rural one, where agriculture was the main activity of labourers, to the rise of the new mercantile communities where craftsmanship and trade were predominant – the kind of society where time was (in the words of Jacques Le Goff) the merchant's time, required a more and more precise notion of time, and one that could be valid across the countries where merchants went to sell their goods. The old system of "unequal hours" where the length of the hour varied over the

[1] *Campane*-bells are so called by peasants who live in the fields – *in campo* – and cannot tell the time except by the bell toll (my translation).

course of the year and from one country to another was no longer adequate to suit the needs of the various new jobs. The astrolabe allowed – amongst other things – to pass from one system to the other and back in a relatively easy way.

That the difference was clear in Chaucer's mind can be found once more in *The Squire's Tale* (line 64) where we read that describing the king's rich array would be too long and take a "someres day," hat is a period when days were longer, evidently calculated with the old method of "unequal hours."

The second element which made the astrolabe an important tool was theoretical and derived from the discovery of Aristotle's *libri naturales*, and of the eight books of his *Physics* in particular. Aristotle's definition of time as the measurement of the movement of the *Primum mobile* was accepted and repeated by many authors and soon taken as the standard notion of time, not, however without difficulties and ambiguities.

The beginning of movement – that is, when change could be said to occur – and its end, when it ceased to exist, the possible division of *continuum* into parts, finite or infinite, etc., were problems heatedly debated in academic circles. In general, it can be said that during the thirteenth and the fourteenth centuries the problem of the nature of time tended to become quantitative rather than qualitative. Enquiries concerned the way a phenomenon occurred rather than the reason for its occurrence, the "how" rather than the "why" in William J Courtenay's words, and this made time once more an object of study for logicians and mathematicians (Courtenay xiii). Anyway, the subject was considered important enough to be thought appropriate for the instruction of a child of ten, who could reasonably be expected to be more interested in a hobby horse than in the horse as a synecdoche for the astrolabe. The dedication to "little Lewis" has often been considered little more than a narrative device, but the way the astrolabe is described and the language used to explain its workings show that – surprising as it may seem to us – the *Treatise* is really addressed to a young boy. In the very interesting *Introduction* the speaking voice explains that he has given the child a somewhat simplified version of an astrolabe and that it has been built on the latitude of Oxford. This means that either there was only one of the circular plates called "the climates" or that the Oxford latitude was engraved on the mother (the main body) of the instrument, thus greatly simplifying calculations. The pedagogical aim of the *Treatise* is further illustrated by the writer's remarks on language: Lewis knows little Latin and therefore English is used. This is interesting in itself because, while the vernacular was by that time widely accepted in poetry or narrative, the language of science was definitely Latin – and Latin it would remain for a long time yet. But there is more: English is used not only to make a difficult subject understandable to a young child not proficient enough in Latin, but because it is equivalent to it:

> This tretis, divided in 5 parties, wol I shewe the under full light reules and naked wordes in Englissh, for Latyn canst thou yit but small, my litel sone. But natheless suffise to the these trewe conclusions in Englissh as wel as sufficit to these noble clerkes Grekes these same conclusions in Grek; and to Arabiens in Arabik, and to Jewes in Ebrew, and to Latyn folk in Latyn; which Latyn folk had them first out of othere diverse languages , and written them in her owne tunge, that is to seyn, in Latyn. And God woot that in alle these languages, and in many moo han these conclusions ben suffisantly lerned and taught, and yit by diverse reules; right as by diverse pathes leden diverse folk the righte way to Rome. (I,1)

The same ideas can be expressed in the different languages according to their individual rules and they convey the same information; after all, you can reach Rome by following different routes. Moreover, the treatise was not originally written in Latin, but only translated into that language. It is interesting to note that here Latin – the well-known language of the authorities – is considered some sort of vernacular itself, a language one translates into as well as translating from. It is also probably the first mention of the Middle English vernacular as the king's English ("lord of this langage" I 57), a remarkable statement in which power over language is considered as part of the political power. But even the use of the vernacular can be "curious," that is, too elaborate; therefore the language of the treatise will be simple and plain, with some kind of repetition (. . ."me semith better to written unto a child twyes a god sentence, that he forgete it onys" ll 47-50), because a child is likely to forget what has been said and needs to be reminded.

Of the promised five parts, only two have survived. The third part was to deal with the measurement of longitudes and latitudes. The fourth and fifth parts should have been devoted to the theory of Astronomy and Astrology, and it is a real pity we lack the relationship between the practical instructions for the use of the instrument and their theoretical bases. Of the parts that are extant the first deals with the description of the astrolabe and the second provides examples of the calculations that can be made by it.

In both parts the language combines the kind of scientific discourse one is likely to find in a treatise on Astronomy with the acute consciousness of the extreme youth of the addressee. This pedagogical attitude is further emphasised by the special relationship between teacher and pupil, who is introduced as the writer's son. The result is a language that shows the effort of keeping the level of the scientific explanation as rigorous as possible, while at the same time trying to arouse the interest of a young student whose attitude to schoolwork and the range of whose knowledge the writer is familiar with. All the technical terms are carefully defined – which is, of course, to be expected in a scientific text – but here this feature is extended to words the meaning of which could be considered obvious:

> And tak kep, for from henes forthward I wol clepen the heighte of any thing that is taken by the rewle "the altitude," withoute moo wordes.
> (I,1)

A second feature is the constant effort to obtain the addressee's attention; expressions such as "tak kep," "understond well" or "rekene" tend to help him focus on important issues, while the insistence on the origin of words tries to make a complicated taxonomy less difficult to remember:

> "This same circle is clepid also the Equator, that is the weyer of the day"
> (I,17)

or, perhaps:

> "Zodiac is clepid the circle of the signes, or the circle of the bestes, for zodiac in language of Grek sowneth 'bestes' in Latyn tunge."
> (I, 21)

But by far the most interesting linguistic feature from the point of view I am considering is the obsessive use of possessive adjectives. "Thyn astrolabe" is used throughout and is partly justified by the fact that "little Lewis" has a smaller astrolabe and the speaker has to refer to that particular instrument to tell the child what he wants him to learn. But in some cases this is not a sufficient justification. For example:

> Set the degree of *thi* sonne upon *thin* est orisonte, and ley *thi* label on the degree of the sonne, and that the point of *thi* label in the bordure set a pricke. Turne then *thy* riet aboute tyl the degree of *thi* sonne sitte upon the west orisonte, and ley *thi* label upon upon the same degree of the sonne, and at the poynt of *thy* label set another pricke. Reckne than the quantite of tyme on the bordure bitwixe bothe prickes, and tak there *thyn* arch of the day. (II, 7) [italics mine]

This insistence appears to be a pedagogical device to establish some sort of contact between a very young boy and a complex instrument, to encourage the boy to "take possession," so to speak, of the astrolabe, thus making him psychologically involved in a difficult subject, and thereby mitigating the impersonality and the distance that are typical of scientific discourse.

Consistently with this point of view, sentences have generally a paratactic structure; subordinates are relatively rare and clarity and evidence are always sought. The result is a language that is essential, economic, and precise: words are carefully weighed and the speaker never seems to forget that – truly or fictitiously – he is a father trying to make the principles of Astronomy and Astrology attractive to his very young son. Thus, the usual features of scientific writing are even more evident in the writer's attempt to find a balance between the conciseness of scientific discourse and the need to explain even relatively easy concepts at greater length because of the pupil's age. But the difficulties of the subject-matter are never concealed and the technical terms are explained but not avoided, especially when a word commonly used in everyday language acquires a more restricted meaning when referred to a scientific phenomenon. An interesting example is offered by the word "conclusioun" which besides the usual meaning that prevails in the *Introduction* and in the first part, technically indicates the operations that must be performed to obtain a certain result; in a similar way, the word "equacion" is here equivalent to "calculation." These differences with respect to ordinary language are always accompanied by an accurate description of the phenomenon that is being analysed:

> *Another conclusioun to prove the latitude of the regioun*
> Understonde wel that the latitude of eny place in a regioun is verrely the space bytwixe the cenyth of hem that dwellen there and the equinoxiall cercle north or south, taking the mesure in the meridional lyne . . .
> (II, 25)

In general, the language of this treatise reminds us of the fact that in the fourteenth century "natural philosophy" was in an intermediate position between what we now call "mathematics" and a highly developed and elaborate logical science. That Chaucer was perfectly aware of the debate that was going on at British and continental universities (Oxford, Paris, Bologna) is now generally accepted by scholars (Bennett). Possible further evidence can be found in the remarks on language Chaucer makes at the beginning of his *Treatise* (the whole passage is quoted above):

> But natheless suffise to the these trewe conclusions in Englissh as wel as sufficit to these noble clerkes Grekes these same conclusions in Grek; and

> to Arabiens in Arabik, and to Jewes in Ebrew, and to Latyn folk in Latyn; which Latyn folk had them first out of othere diverse languages . . .
>
> (I,1)

This statement can be profitably compared to a passage in Roger Bacon's *Sumulae Dialectices* where the philosopher maintains that language established by convention (*ad placitum*) is understood by people according to their birthplace and that the same concept can be conveyed in different languages:

> . . . homo non interpretatur omni homini, sed alicui, quia Gallicus Gallico, Graecus Graeco, Latinus Latino, et hec solum.
>
> (Bacon 233)

> [A man is not understood by all men, but only by some of them, since a Frenchman (is understood) by a Frenchman, a Greek by a Greek and a Latin by a Latin, and only by them.] (my translation)

From this point of view it may be interesting to compare the kind of scientific writing I have been trying to describe with a treatise on the logic of propositions composed by Richard Billingham between 1340 and 1350 at Oxford. Billingham was one of the so-called "Oxford calculators," a group of scholars engaged in finding quantitative methods to solve problems that were usually addressed by means of the traditional grammatical and logical analysis. Thomas Bradwardine, Ralph Strode, Richard Kilvington, William Heytesbury, Roger Swineshead, John Dumbleton and, of course, Richard Billingham, were all actively engaged in the study of *sophismata* and of *insolubilia* (paradoxes), as well as in discussing questions related to natural philosophy and even to theology by means of methods – until then limited to arithmetic and geometry – which implied the "measurement" of the truth-value of propositions. Billingham's treatise is called *Speculum puerorum* and survives in about twenty-five manuscripts. We do not know whether the extant texts are the author's original version or *reportationes*, that is the result of notes taken by some student during the master's lectures (de Rijk 203). The treatise was well-known and on the syllabus at Oxford, Paris, Bologna and Padua for many years, as the numerous commentaries show, and the author was believed to combine the old with the new logic, the *logica vetus* with the *via moderna*. This fact, according to one of his commentators, could be traced in his very name: "Billingham," "bis ligam," "to link," "to establish relationships" (Bos 373). The fact remains that the title is rather surprising: that a treatise on terminist logic should be addressed to a "puer" raises a number of interesting questions: who was a *puer* in the fourteenth century? At what age could a boy be expected to understand *suppositio*, *appellatio* and other difficult logical concepts? We know that during the Middle Ages elementary education began when children were about seven and consisted of recognition and pronunciation of words, usually taken form religious texts, followed, at a later stage, by the study of Latin grammar and syntax, which lasted for six or seven years (Courtenay 16). *Trivium* and *Quadrivium* were studied when a student entered University at about thirteen, and before that time he knew little mathematics and no astronomy, which was part of the *Quadrivium*.

Unfortunately, we know very little about Chaucer's readings and Billingham's *Speculum* is no exception: there is no direct proof that the poet knew and used it, but his *Treatise on the Astrolabe* and Billingham's *Speculum puerorum* seem to have in common both the scientific interest and the pedagogical concern. Here I can only point out some of the affinities and offer some tentative conclusions. The relationship between the idea of time and the analysis of propositions, which dates back to Aristotle, experienced a revival when the Philosopher's *Physics* and his *Posterior Analytics* became known to medieval intellectuals (Travis 18). In the first of these works the nature of motion is analysed while the second includes a discussion of the nature of necessary propositions. A new approach to old problems coincided with the new interest in the measurement of time we have just discussed. The main idea involved was once more the nature of change: the different sciences – it was argued – deal with phenomena that are not always the same, but are subject to modifications. What scientists describe is some sort of "average" behaviour, i.e. what happens in the majority of cases (*ut in pluribus*). This concerns both the various disciplines and the same discipline in its time evolution (Bos 363). The problem therefore arises whether it is possible to formulate propositions that are general and necessary about an ever - changing nature which seems to defy exact and stable definitions. To this state of things the Oxford calculators – and Billingham in particular – try to oppose the study of mutability with mathematical methods, thus trying to isolate what can be considered certain and necessary from what is uncertain and contingent, and applying to mutable phenomena methods generally used for the study of immutable objects. In the language of logic, their interest shifted from the *res permanentes* to the *res successivae*, which included the study of motion and time. Questions concerning the beginning or the ceasing of motion, the continuous or discrete character of time, what exactly measuring something that changes constantly meant, were the main interests of these scholars and quantitative methods were devised to find feasible answers to them. Billingham gives a number of definitions which are also the criteria to establish the truth-value of a proposition containing the idea of change. Among other things, he concentrates on the two main verbs that seem to summarise the kind of question at issue: *incipit* (begins) and *desinit* (ends), and devises a number of sophisms which show the ambiguous nature of verbs that at first sight appear to indicate something definite and stable:

> "Incipit" exponitur cum quatuor propositionibus disiunctivis per istum modum. Ut "Sortes incipit esse": Sortes nunc est; et inmediate ante hoc tempus quod est presens, non fuit ita quod Sortes est; igitur sic est quod Sortes incipit esse.
> Sed "desinit" converse modo exponitur. Ut "hoc desinit esse verum" probatur: hoc nunc non est verum; et inmediate ante hoc tempus presens erat ita quod est verum; igitur hoc desinit esse verum.
> (*Speculum puerorum*, II,45-46, ed. de Rijk 225).

> ["Begins" can be analysed with four disjunctive propositions in the following way. For example: "Socrates begins to exist": Socrates exists now; and immediately before this time, which is the present time, it was not a fact that Socrates existed; therefore the fact is that Socrates begins to exist. "Ceases" can be analysed in the opposite way. For example: "this ceases to be true" can be proved as follows: "this now is not true"; and immediately before the present time, the fact was that it was true; therefore, this ceases to be true.] (my translation)

Chaucer seems to be perfectly aware of the debate that concerned the nature of time; he was a friend of some of the Oxford masters (Strode, Bradwardine) whom he mentions in his works. In his *Treatise* he seems to remember Billingham's propositional analysis: in describing the astrolabe he defines the parts of the instrument very thoroughly and the operations necessary to prove their importance in the measurement of time:

> The este side of thyn Astolabe is clepid the right side, and the west side is clepid the left side. Forget not thys, litel Lowys. Put the ring of thyn Astrolabe upon the thombe of thy right hond, and than wol his right side be toward thy left side, and his left side wol be toward thy right side. tak this rewle generall, as wel on the bak as on the wombe side. Upon the ende of this est lyne, as I first seide, is marked a litel cross (+), where as evere moo generaly is considered the entring of the first degree in which the sonne arisith. (I,6)

We can easily imagine that a treatise that described change by forming "complex propositions of individual things and of their changing properties" (Bos 364) must have appealed to Chaucer when he was trying to describe an instrument – the astrolabe – that was devised to account for the passing of time, that is, for nature's most important change. Although the *Treatise on the Astrolabe* is certainly not a work on logic, the method of Billingham's analysis – provided Chaucer knew his treatise – could not fail to arouse his interest and could prove extremely useful in fulfilling both Chaucer's purposes, namely the achievement of scientific precision and of the clarity of the exposition. The way Billingham intends the *probatio propositionis* has also a strong pedagogical value: to break up a sentence in its component parts, to give numerous examples together with directions to actually build up sentences, and to use paradoxes to show grammatical and syntactical inconsistencies is a way of allowing meanings to emerge clearly. If the *Speculum puerorum* is indeed meant for very young students, Chaucer had before him a text which, in spite of the differences, could provide him with a writing model as he was trying to explain a difficult subject to a child of ten. Following Aristotle's sentence according to which in demonstrations one must proceed from what is best known to what is least known (*Posterior Analytics* I, 2, 71b, 20-22), Billingham starts with an apparently obvious proposition and shows its meaning by giving examples and showing how syllogisms are generated:

> Terminus resolubilis est omnis terminus, sive fuerit nomen, pronomen vel quecumque pars, qui habet saltem inferiorem terminum se secundum praedicationem; . . .Sicut hec proposition: "homo currit" sic probatur per terminos singulares istius termini "homo": "hoc currit" et "hoc est homo"; ergo homo currit", . . .(I, 2, ed. De Rijk 213)
>
> [A resolvable term is any term, whether noun, pronoun or any other part (of speech) which has at least one term inferior to itself according to predication; . . . So this proposition: "man runs" can be proved by means of singular terms of the term "homo": "this runs" and "this is a man"; therefore "man runs"] (my translation)

The truth of the proposition can be proved by breaking up the sentence into its component parts and analysing them individually, only to put them together again to re-construct the proposition, but this time clearly and without ambiguity. Chaucer's statement "sothly me semith better to written unto a child twyes a god sentence, that he forgete it onys" (*Introduction* 47-50) can be interpreted not only in terms of mere repetition of phrases, but as an allusion to the method of analysis adopted by logicians, and by Billingham in particular, according to which the proposition is analysed in its parts and then the component words are put together again after their function has been explained. Thus the sentence is quoted twice, but the second time as the result of a linguistic and semantic construction, and is easier to understand and therefore to remember.

In a similar way, Chaucer's already-mentioned remarks about the use of the vernacular, and in particular the idea that a concept can be expressed in Latin as well as in any other language and convey the same meaning, in spite of the grammatical and syntactical rules of the individual languages (. . . in alle these languages . . . han these conclusions ben suffisantly lerned and and taught, and yit by diverse reules [*Introduction* 37-39]) seems to share Billingham's conviction that truth and falsity are in the soul, not in things (Bos 368):

> Nulla propositio singularis potest probari ratione sui termini discreti vel singularis per aliquod inferius sed solum probatur per sensum vel intellectum
> (II, 12, ed de Rijk 217)
>
> [No singular proposition can be proved on the basis of its discrete or singular term by means of an inferior term, but only by means of either sense or intellect] (my translation)

Chaucer seems to share Billingham's pedagogical concern in developing his subject in logical steps and by means of a rigorous *probatio propositionis*, by emphasising the difference between terms , by maintaining that knowledge must be acquired starting from the less known and proceeding gradually and without gaps. This – together with the fact that also Billingham's treatise is addressed to a *puer* – may have suggested to the English poet that by careful definition and systematic explanation, his little son could be instructed in the use of a complex instrument where time could be made intelligible, be unambiguously defined and objectively measured. The astrolabe becomes then for the child the experimental equivalent – so to speak – of the solution of a logical problem by means of truthful propositions, but less abstract and easier to grasp.

References

Aristotle. *Posterior Analytics.* Trans. G. R. G. Mure. *The Internet Classics Archive*, 1, 2, 71b, 20-22. http://classics.mit.edu/Aristotle-/posterior.html

Bacon, Roger. "Sumulae dialectices." *Opera hactenus inedita R.Baconis*, fasc. V. Ed. R. Steele. Oxford: Clarendon Press, 1940. 233.

Bennett, J. A. W. *Chaucer at Oxford and Cambridge.* Oxford: Oxford University Press, 1974. 58-85.

Benson, Larry D. (gen. ed.). *The Riverside Chaucer.* Oxford: Oxford University Press, 1988. If not otherwise stated, all quotations from Chaucer's works are from this edition.

Billingham, Richard. "Speculum puerorum." Ed. L. M. De Rijk. *Medioevo*, I, 1975. 203-235.

Bos, Egbert. "Richard Billingham's *Speculum puerorum.* Some Medieval Commentaries and Aristotle." *Vivarium*: 45, 2007. 360-373.

Chaucer, Geoffrey. *A Treatise on the Astrolabe.* Ed. Sigmund Eisner. Norman, Oklahoma: The University of Oklahoma Press, 2002.

——. *A Treatise on the Astrolabe.* Ed. Walter W. Skeat. London: Oxford University Press, 1872 (reprinted 1968).

Courtenay, William, J. *Schools and Scholars in Fourteenth-Century England.* Princeton: Princeton University Press, 1987.

Higgins, Anne. "Medieval Notions of the Structure of Time." *Journal of Medieval and Renaissance Studies*, 19:2, Fall 1989.

Kretzmann, Norman. "Incipit/Desinit." *Motion and Time, Space and Matter.* Peter K. Macamer and Robert G. Turnbull, eds. Columbus: Ohio State University Press, 1976. 101-136.

Laird, Edgar. "Astrolabes and the Construction of Time in the Late Middle Ages." *Disputatio*, 2, 1997. 51-69.

Le Goff, Jacques. "Au Moyen Age: temps de l'Eglise et temps du marchand." *Annales ESC*, 1960. 417-433.

Maierù, Alfonso. *Lo "Speculum puerorum sive terminus est in quem" di Riccardo Billingham.* Spoleto: Centro italiano di studi sull'Alto Medioevo, 1970.

North, John D. "The Astrolabe." Scientific American, 230, January 1974. 96-106.

——. *Chaucer's Universe.* London: Oxford University Press, 1988.

Osborn, Marijane. *Time and the Astrolabe in the Canterbury Tales.* Norman: University of Oklahoma Press, 2002.

Rijk de, Lambertus M. "Another 'Speculum puerorum' attributed to Richard Billingham." *Medioevo*, 1, 1975. 203-235.

Travis, Peter. "Chaucer's Cronographiae, the Confounded Reader, and Fourteenth Century Measurements of Time." *Disputatio*, 2, 1997. 1-34.