MANILIUS AND THE COMPUTATION OF THE ASCENDANT

My objective in this article is to show that Manilius *Astronomica* 3. 483–509 is probably spurious.[1] In order to do this, it is necessary first to review the context of the passage.

The whole of *Astronomica* 3. 203–509 is devoted to determining the sign of the Zodiac rising above the horizon at the time of childbirth, that is, the "Horoscopos" or Ascendant. Manilius states at the beginning that "the matter has to be grasped with an agile mind" (203 *agili rem corde notandam*) and that (206–10):

> Quod nisi subtili uisum ratione tenetur,
> fundamenta ruunt artis nec consonat ordo;
> cardinibus quoniam falsis, qui cuncta gubernant,
> mentitur faciem mundus nec constat origo
> flexaque momento uariantur sidera templi.

("Unless one obtains the Ascendant by a refined computation, the basis of the Art collapses and the method is inconsistent; for, if the cardinal points, which govern all things, are wrong, the universe displays a misleading appearance, its rising point does not tally, and the signs vary, being deflected by a shifted temple.") Clearly the matter was of paramount importance to Manilius.

Our author first sets out to describe "the vulgar method of computation" (218 *uulgatae rationis ordo*), where one ascribes two natural hours to every sign for its rising above the horizon (218–24). In order to clarify what is involved here, an example is useful. Let us assume that a birth occurred in Rome at 7:30 hours, sundial time, when the Sun was entering Taurus (i.e., 30°). Converting this time into degrees by multiplying by 15, one obtains 112.5°, which, added to the degrees where the Sun is located (30°), produces 142.5°, that is, Leo 23° as the Ascendant. Since the true Ascendant[2] lies in Virgo 1°, the result thus obtained through the use of the vulgar method is off target by 8°.

Hence Manilius objects, "But the Zodiac belt lies on a slant" (225 "sed iacet obliquo signorum circulus orbe"), due to the observer's geographical latitude, and the rising time of the signs varies. The poet then goes into considerable detail (225–384) to explain how latitude affects the length of the days in the various seasons and the rising time of the signs. This is a long and explicit development which shows that Manilius had a clear grasp of the problem. Throughout he insists that one has to follow "in the footsteps of the truth" (247 *vestigia ueri*) and to show "a wise and vigilant mind" (276 *animo sagaci*, 295 *uigilanti mente*). In conclusion, he provides the reader with a scheme "so that a wrong Ascendant would not be in error because of a dubious computation" (389 "ne falsus dubia ratione horoscopos erret"). This "dubious computation," no doubt, is the vulgar method he has criticized earlier. "One should follow a secure method," says Manilius (390 "certa sub lege sequendum est"). One takes the number of equinoctial hours of daylight at the summer solstice (approximately 15 in Rome) and divides

1. An early draft of this paper was read at the annual meeting of the American Philological Association in Boston in December 1979.

2. For this and other data obtained from trigonometry, see the appendix. It is assumed that the maximum length of daylight in Rome at the summer solstice is 15 hours.

this amount by 6; the result, 2 hours 30 minutes, is the length of time needed by Leo and Scorpio to rise above the horizon in the latitude of Rome. One takes the number of equinoctial hours of daylight at the winter solstice (9) and divides it also by 6; the value obtained, 1 hour 30 minutes, is the rising time of Taurus and Aquarius. One third of the difference between these rising times, that is, 20 minutes, is the progressive increment which leads from one rising time to the next. One can construct the following table of rising times:

TABLE 1

Sign		Rising Time
Aries	Pisces	1 hour 10 minutes
Taurus	Aquarius	1 hour 30 minutes
Gemini	Capricornus	1 hour 50 minutes
Cancer	Sagittarius	2 hours 10 minutes
Leo	Scorpio	2 hours 30 minutes
Virgo	Libra	2 hours 50 minutes

This means that in Rome Aries will take 1 hour 10 minutes to rise above the horizon, Taurus will take 1 hour 30 minutes, and so on.[3]

Manilius, having described this scheme (385–442), concludes (439–42):

> Quod bene cum propriis simul acceptaueris horis,
> in nulla fallet regione horoscopos umquam,
> cum poterunt certis numerari singula signa
> temporibus parte ex illa quam Phoebus habebit.

("When you get a good grasp of it with the appropriate rising times, never is the Ascendant going to elude you in any region, as all the signs will be computed according to their specific rising times, starting from this degree that the Sun will occupy.")

There follows a somewhat lengthy passage (443–82) where Manilius expounds a method by which the length of the days throughout the year can be computed for any specific location. This development has been termed a digression by

3. These values do not square perfectly with the true ones as computed by Ptol. Alm. 2. 8 which appear in table 2.

TABLE 2

Sign		Rising Time	Increment
Aries	Pisces	1 hour 10 minutes	
Taurus	Aquarius	1 hour 25 minutes	+ 15 minutes
Gemini	Capricornus	1 hour 55 minutes	+ 30 minutes
Cancer	Sagittarius	2 hours 24 minutes	+ 29 minutes
Leo	Scorpio	2 hours 34 minutes	+ 10 minutes
Virgo	Libra	2 hours 33 minutes	− 1 minute

As one can see, the progression from one sign to another is not regular. This explains why the method advocated by Manilius, which uses even increments for all the signs, seemed in turn somewhat "vulgar" to Ptolemy (*Tet.* 1. 20. 44). Needless to say, Manilius did not invent the proposed scheme, which is of Babylonian origin.

scholars unfamiliar with the technique involved.[4] In order to convert sundial hours into equinoctial hours (a step needed to find the Ascendant), one has to know the ratio between the length of a particular day and the average 12 equinoctial-hour day. Manilius suggests that we construct a second table which will provide us with the number of equinoctial hours of daylight during the year. One takes the difference between the longest and the shortest day (here 15 hours − 9 hours = 6 hours) and divides it by 6. The resulting value, 1 hour, represents the increase in daylight time occurring after the Sun has travelled through Aquarius. Half of this amount, 30 minutes, is the increase produced by Capricorn, and one and one half this amount, 1 hour 30 minutes, the increase produced by Pisces. The signs following next, Aries, Taurus, and Gemini, get similar increases, but in reverse order. All of these individual increases are cumulative and, added to 9 hours (the number of hours in the shortest day), yield the length of daylight time.

TABLE 3

End of Sign		Individual Increase	Accumulated Increase	Length of Day[5]
Sagittarius		0 hours	0 hours	9 hours
Capricornus	Scorpio	0 hours 30 minutes	0 hours 30 minutes	9 hours 30 minutes
Aquarius	Libra	1 hour	1 hour 30 minutes	10 hours 30 minutes
Pisces	Virgo	1 hour 30 minutes	3 hours	12 hours
Aries	Leo	1 hour 30 minutes	4 hours 30 minutes	13 hours 30 minutes
Taurus	Cancer	1 hour	5 hours 30 minutes	14 hours 30 minutes
Gemini		0 hours 30 minutes	6 hours	15 hours

4. A. E. Housman, *M. Manilii "Astronomicon" liber tertius* (Cambridge, 1937), pp. xviii–xx, writes: "We have thus been put in possession of a rule enabling us, in any latitude, to determine the time occupied by each sign in rising, and so to ascertain the place of the horoscope. If our instructor has an alternative rule for finding the horoscope, and he has, now is the time to give it. But no: we must wait till verse 483. First we must listen while he sets forth a method of discovering, in any latitude, the rate at which daylight increases between midwinter and midsummer. The information, if true, is interesting and even, for some purposes, useful; but not for the purpose of determining the ascension of the signs or ascertaining the horoscope. No matter: Manilius cannot forgo the pleasure of dressing up more arithmetic in more figures and tropes. "quod uno uerbo potuit," says Scaliger, "pluribus ambagibus maluit, ad fertilitatem ingenii ostentandam." Inappropriate as the paragraph is to its place, there is yet no place in the book to which it would be less inappropriate; and in form and structure it has much affinity with the paragraph preceding, which apparently suggested it to its facile and frivolous author . . . . The digression over, we come to an alternative method of finding the horoscope . . . ." This simply shows that Housman had no idea how to compute the Ascendant the way Manilius did. G. P. Goold, in his recent edition of Manilius (Cambridge, Mass, and London, 1978), p. lxxv, follows in Housman's footsteps by calling the passage a digression.

5. Given the hour angle of the Sun "h" (see the appendix), the length of the day is derived from "2h/15." This yields (end of sign in left column, length of day in right):

Sagittarius		9 hours
Capricornus	Scorpio	9 hours 29 minutes
Aquarius	Libra	10 hours 38 minutes
Pisces	Virgo	12 hours
Aries	Leo	13 hours 22 minutes
Taurus	Cancer	14 hours 31 minutes
Gemini		15 hours

So the values of Manilius here are close enough to the values obtained from spherical trigonometry.

With the table of day lengths and the table of rising times, one can determine the Ascendant in the following way. When the Sun enters Taurus, that is, when it exits Aries, as at the time of the birth we are considering in our example, the day is 13 hours 30 minutes long, as seen in the table of day lengths. The ratio 13 hours 30 minutes: 12 hours enables us to convert 7 hours 30 minutes, sundial time, into 8 hours 26 minutes, equinoctial time, elapsed since sunrise. During this period, as many signs of the Zodiac will rise over the horizon as is permitted by the table of rising times:

rising time of Taurus	1 hour 30 minutes
rising time of Gemini	1 hour 50 minutes
rising time of Cancer	2 hours 10 minutes
rising time of Leo	2 hours 30 minutes
sum	8 hours

We had a total rising time of 8 hours 26 minutes; we are thus left, after the successive rising of these signs, with 26 minutes during which a part of Virgo will rise. Since according to our table the whole of Virgo rises in 2 hours 50 minutes, we find the Ascendant at:

$$\text{Ascendant} = \frac{0 \text{ hours } 26 \text{ minutes}}{2 \text{ hours } 50 \text{ minutes}} \times 30^\circ = \text{Virgo } 5^\circ$$

The distance from the true position at Virgo 1° is 4°; this is twice as accurate as the value Leo 23° obtained by the vulgar method.

There could be cases for which the vulgar method would accidentally yield more accurate results, but the scheme put forth by Manilius is certainly superior. In an experiment to check its actual reliability, 55 different examples were worked out with different geographical latitudes, different times of the day, and different positions of the Sun on the ecliptic.[6] It was found that, compared with true values computed from spherical trigonometry, the vulgar method yields Ascendant values with a standard deviation of 10.3° while the method advocated by Manilius produces a standard deviation of 2.7°. If we are faced with a normal distribution, this means that in about 95 percent of cases the vulgar method would fall within 22° of the true Ascendant and the scheme of Manilius within 5°. Although Manilius was not using accuracy as a criterion in a modern scientific way, he was concerned about obtaining worthless charts by putting the Ascendant in the wrong place. He was thus preoccupied with precision, and he was totally justified, it seems, in his rejection of the vulgar method and in his adoption of a more accurate one.

6. The examples are:

M \ SDT	1	2	3	4	5	6	7	8	9	10	11
13	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°
14	300°	330°	0°	30°	60°	90°	120°	150°	180°	210°	240°
14.5	240°	270°	300°	330°	0°	30°	60°	90°	120°	150°	180°
15	180°	210°	240°	270°	300°	330°	0°	30°	60°	90°	120°
16	120°	150°	180°	210°	240°	270°	300°	330°	0°	30°	60°

At this point in the text, something very peculiar happens. The poet suddenly announces another method for computing the Ascendant, and what he proceeds to expound (483–509) is exactly the same vulgar method which he had previously described and condemned. The only difference is that, while he had said earlier (218–24) that the vulgar method consisted of counting 2 hours of rising time per sign, he now says one multiplies the sundial time by 15 in order to get the number of degrees rising. The wording may be different, but the substance is the same. Commentators (Bouché-Leclercq, Housman, Goold) think Manilius blundered. While it is true that he often did (as, e.g., when he put Orion in Aries 10°, *Astr.* 5. 57–66), the care with which this whole question of the Ascendant is treated rules out any mistake due to carelessness or inattention. The possibility that he did not understand much of the problem involved is also precluded by our previous analysis. It therefore seems logical to venture the hypothesis that the passage from 483 to 509 is spurious.[7]

APPENDIX: COORDINATES OF THE SUN AND COMPUTATION OF THE ASCENDANT

Data: maximum number of hours of daylight $= M = 15$ hours; longitude of the sun $= L = 30°$ (the latitude is taken as $0°$); sundial time $= SDT = 7{:}30$ hours; obliquity of ecliptic $= e = 23.7°$ (i.e., at the time of Manilius). *Coordinates of the sun:* geographical latitude of Rome $= \phi = 41.08°$ (from: $\tan \phi = -\cos [(M \times 15) \div 2]/\tan e$); right ascension of the sun $= \alpha = 27.864°$ (from: $\tan \alpha = \tan L \cos e$); declination of the sun $= \delta = 11.594°$ (from: $\sin \delta = \sin L \sin e$); hour angle of the sun $= h = 100.303°$ (from: $\cos h = -\tan \delta \tan \phi$). *Local sidereal time:* local sidereal time $= LST = 52.940°$ (i.e., 3:32 hours) (from: $LST = [hSDT/6] - h + \alpha$). *Ascendant:* Ascendant $= ASC = 151° =$ Virgo 1° (from: $\tan ASC = -\cos LST/[\sin e \tan \phi + \cos e \sin LST]$).

PIERRE BRIND'AMOUR
University of Ottawa

7. The *Astronomica* as it has come down to us in the manuscripts is full of apocryphal verses which modern editors have had to bracket. There are 45 of them in the recent edition by G. P. Goold. There are also numerous gaps in the text, as well as inverted and dispersed passages. So, an addition of the kind and length suggested here is not improbable.

ON A CITATION OF JULIUS ROMANUS IN CHARISIUS

The text of Charisius *Ars grammatica* 1. 70. 8 published by K. Barwick reads: "Romanus autem in libro de analogia VII refert sic."[1] There are no comparable references to numbered books in Charisius's other citations of Julius Romanus,

1. *Flavii Sosipatri Charisii artis grammaticae libri V*, addenda et corrigenda collegit et adiecit F. Kühnert (Leipzig, 1964) (= *GL* 1. 56. 4). The reading is presented as part of the suppletion, based on the *excerpta Cauchii* and the text of H. van Putschen, proposed for the lacuna following "in libro de an . . ." in N (= *codex Neapolitanus* IV A 8 [saec. vii/viii]; the lacuna follows "in libro de analogia . . ." in n = *codex Neapolitanus* IV A 10 [saec. xv/xvi]).