III.—Some Astronomical Cruces in the *Georgics*

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Vergil's perfunctory interest in astronomy led him to make unwarranted assumptions about stellar risings and settings. In 1.221 f. the implication that the morning setting of the Pleiades synchronized closely with the evening setting of α Coronae Borealis may be due to awareness that the evening rising of the former occurred two days later than the morning rising of the latter; and in 4.234 f. the mention of Pisces shows that the poet confused the morning and the evening settings of the Pleiades. But the choice of *adverso* (not *averso*) in 1.218, the technical use of *redit* in 3.351, and the precision of 4.425 ff. all suggest that his knowledge was perhaps less shallow than that of other Roman poets.

"Nec, si rationem siderum ignoret, poetas intellegat, qui (ut alia omittam) totiens ortu occasuque signorum in declarandis temporibus utantur" said Quintilian of Γραμματική;[1] but successive Vergilian commentators have not profited by this advice. In the *Georgics* there are two pairs of lines which deal specifically with risings and settings, and of these the first (1.221 f.) has been taken too much for granted, while the second (4.234 f.) has never been interpreted satisfactorily. A third astronomical allusion (4.425 ff.) also awaits further elucidation.

Since the first of these three passages is preceded by a well-known crux (1.218) which deserves some comment, the full context is given.

I

Vere fabis satio; tum te quoque, Medica, putres
accipiunt sulci, et milio venit annua cura,
candidus auratis aperit cum cornibus annum
Taurus, et adverso cedens Canis occidit astro.
at si triticeam in messem robustaque farra
exercebis humum solisque instabis aristis,
ante tibi Eoae Atlantides abscondantur
Gnosiaque ardentis decedat stella Coronae,
debita quam sulcis committas semina quamque
invitae properes anni spem credere terrae.
multi ante occasum Maiae coepere; sed illos
exspectata seges vanis elusit avenis.
si vero viciamque seres vilemque phaselum
nec Pelusiacae curam aspernabere lentis,
haut obscura cadens mittit tibi signa Bootes:
incipe et ad medias sementem extende pruinas.

[1] *Inst. Orat.* 1.4.4.

A (217 f.)

"*Averso* autem *astro* duplex lectio est, nam alii *adverso* legunt" said Servius, and in modern times the choice of editors has fluctuated between the two readings. De la Cerda (1608) preferred *adverso*, which is found in the Medicean MS (*M*) and the Berne scholia; but Niklaas Heinsius (1664), despite his high regard for *M*, misinterpreted the line and gave his approval to *averso*, the chief authorities for which are *APR*γ and Probus. Such misinterpretations as are caused by the retention of *averso* still persist, because editors and commentators know little of the figures with which the constellations were invested in antiquity or of the directions in which they face. Like his contemporary Heyne (1767 and 1800), J. H. Voss (1789 and 1800) broke away, however, from the authority of Heinsius, and in returning to *adverso* observed charitably: "Die übrigen Missdeutungen werden besser verschwiegen, als widerlegt"; and indeed no useful purpose is served by cataloguing all the foolish explanations which have appeared before and since his time.[2]

Line 218 was first explained by Macrobius, so clearly that those who have misunderstood it since his time can make no excuse. After quoting both 217 and it as printed above,[3] he remarked:

> non enim vult intellegi Tauro oriente cum sole mox in occasum ferri Canem, qui proximus Tauro est, sed occidere eum dixit Tauro gestante solem, quia tunc incipit non videri sole vicino.
>
> (*Somn. Scip.* 1.18.15)

Vergil's "candidus . . . Taurus" suggests the entrance of the sun into the zodiacal sign or constellation Taurus in April, the "opening month," when he "aperit annum"; just as in 1.208: "Libra die somnique pares ubi fecerit horas," *Libra* implies his entering the

[2] Of the more recent editions commonly regarded as standard, those of Ribbeck (1859 and 1894), Conington-Nettleship-Haverfield (1898), Hirtzel (1900) and Sabbadini (1930) all printed *averso*. Janell (ed. 2, 1930), however, dissented from Ribbeck in restoring *adverso* to his Teubner text, and the Loeb and Budé editors, Fairclough and Goelzer, also adopted this reading.

[3] Although Ribbeck appears to impugn *adverso* as quoted in the text of Macrobius, von Jan (1848) and Eyssenhardt (1868 and 1893) with justifiable confidence regarded any critical note in its defense as unnecessary. Macrobius (*Somn. Scip.* 2.8) again came to the rescue of Vergil's astronomical reputation by suggesting that the poet did not think of the ecliptic as cutting across the temperate zones; for in "via secta per ambas" (*Georg.* 1.238), he preferred to believe that *per* may mean *inter*, just as it does *ibid.* 244 f.: "maximus hic flexu sinuoso elabitur Anguis | circum *perque* duas in morem fluminis Arctos" (cf. Housman on Manil. 4.204). See William Harris Stahl, "Astronomy and Geography in Macrobius," *TAPhA* 73 (1942) esp. 253 f.

sign Libra at the autumnal equinox, and in 1.238 f.: "via secta per ambas (zonas), | oblicus qua se signorum verteret ordo," *ordo signorum* really refers to his motion in the fixed zodiac. If he entered Taurus on April 17, as Columella said,[4] the Dog-star, called variously by the poets Canis, Canicula[5] or Sirius, would appear during the next thirteen days to draw nearer each evening to the horizon from his first visible appearance after sunset, until at last he set heliacally on April 30.[6] Keightley, still unequalled in the English language for the clarity of his exposition of the *Georgics*, succinctly interpreted Vergil's meaning thus: "*Canis*, Sirius, the dog-star. This star sets heliacally, i.e. is lost in the effulgence of the sun, a few days after he has entered Taurus. It is therefore said to give way (*cedere*) to this sign. — *adverso astro*, sc. *Tauro*, a dat.; for Taurus, from his position on the sphere, directs his horns, as it were, against Sirius. The poet here too had an image before his mind, namely that of a bull keeping off a dog." [7]

Canis is certainly nominative. If it were genitive, *Taurus* would be the subject of *occidit;* but such stress laid on the Bull's setting would be inappropriate in a passage which describes him as the harbinger of the opening year. Furthermore *cedens* is the simple participle for the compound *decedens* and suggests "setting in the evening," as will be shown in the subsequent discussion of *decedat* in 222. It also means "giving way to," and requires that *astro*, which is dative, should be understood as *astro Tauri*, again with particular reference by implication to the sun therein. *Astrum* may be used of a zodiacal sign, and *duodena astra* of the whole zodiac, as in 1.231 f.: "idcirco certis dimensum partibus orbem | per duodena regit mundi sol aureus astra." Also such a change of subject and of case in the second of two parallel clauses which are complementary to each other is in Vergil's manner, as in 2.481 f.: "quid tantum Oceano properent se tinguere soles | hiberni, vel quae tardis mora noctibus obstet," where *noctibus* = *noctibus hi-*

[4] Col. 11.2.36. Ovid (*Fast.* 4.713 ff.) gave the date as April 20.

[5] When this name does not apply to Procyon in Canis Minor.

[6] Col. 11.2.37, or April 28 during the Robigalia (Plin. *H.N.* 18.285). See Frazer on Ovid *Fast.* 4.904, where he rightly criticised Ovid's gross error in making Sirius rise when he should be setting heliacally.

[7] *Notes on the Bucolics and Georgics of Virgil* (London, 1846) 169. Forbiger (1845) liked the picture of the Bull with lowered head and projecting horns appearing to charge eastward through the sky and thus opening the year. See also Gilbert Norwood, "Vergiliana," *CQ* 12 (1918) 143.

bernis. Therefore the meaning of 218 is that the Dog-star is giving way at his evening setting to the sun's annual motion towards him from west to east through Taurus, as he does in Manil. 1.398 f.: "nunc horrida frigore surgit, | nunc vacuum soli fulgentem deserit orbem,"[8] where the allusions are (i) to his acronychal or evening rising about January 1, (ii) to his heliacal or evening setting as described by Vergil here.[9]

The twelve signs of the zodiac were honored with preeminent rank among the constellations for the reason mentioned in 1.231 f. (quoted above), wherefore Aeschylus could call them λαμπρούς δυνάστας ἐμπρέποντας αἰθέρι because they brought the changing seasons to mankind.[10] Vergil, followed by Macrobius with his "Canem, qui proximus Tauro est," related the position of the extra-zodiacal Dog directly to the zodiacal Bull, and ignored the fact that the extra-zodiacal Orion acts as a buffer between them. *Adverso* too suggests the attitude of the Bull facing the Dog as patently as *sequentis* the contiguity of the Scorpion's Claws to the Maiden in 1.33 f.: "qua locus Erigonen inter Chelasque sequentis | panditur."

Although *adverso* is astronomically sound, could Vergil have written *averso?* If he did so, the context can have but one meaning, "the Dog sets, yielding to the sign (of the Bull) which is turned backward." *Averso astro* is not ablative and cannot refer to Canis Maior,[11] which faces westward in the direction of the apparent annual motion of the sky, and therefore towards Taurus, the longitude of which is still farther to the west. Latitudinally Taurus is north and Canis Maior south of the equator. It is a commonplace of celestial chartography that the Bull, whose enigmatic[12] forepart only exists, faces eastward, against the apparent diurnal motion of the sky, and is turned in the direction opposite to that of the annual motion of the sun.[13] Therefore the Dog confronts not only the sun

[8] soli *Housman*, solis MSS.

[9] For lucid explanations of the risings and settings of stars see A. W. Mair, "The Farmer's Year in Hesiod" in *Hesiod: The Poems and Fragments done into English Prose* (Oxford, 1908) 104 ff.; G. R. Mair, "Introduction to the *Phaenomena*" IV E in the Loeb edition of Callimachus, Lycophron and Aratus (1921) 376 ff.; or M. P. Nilsson, *Primitive Time-Reckoning* (Lund, 1920) 5 ff.

[10] *Agam.* 5 f.

[11] So H. W. Garrod on Manil. 2.153 (Oxford, 1911) 80.

[12] In astrology "a female Bull, providentially amputated at the shoulders" (Housman, ed. Manil. II, v). Cf. Ovid's uncertainty in *Fast.* 4.717 ff. and 5.603 ff.

[13] Cf. Manil. 2.201 f.: "ne mirere moras cum sol *aversa* per astra | aestivum tardis adtollat mensibus annum."

advancing through the Bull from back to front, but also of course the Bull himself; and once more the fitness of *adverso* and the ineptness of *averso* in this context are realised. *Aversus* is the perpetual epithet of Taurus in astrology,[14] but in such contexts he is *aversus* from the sun's annual course through the zodiac, and incidentally, when he rises, from the observer on earth. *Adverso* in Vergil is appropriate as a description of the sun in Taurus and in relation to the evening setting of Canis Maior, *averso* would be merely a stock epithet in astrology of the Bull with no reference at all to the Dog in a purely astronomical passage; and for that reason it is, in the words of J. H. Voss, "unerträglich matt." Vergil may not have been so good an astronomer that we can be sure he wrote *adverso*, but he was not so bad a poet as to write *averso*.

In the following lines of Manilius:

> aurato princeps Aries in vellere fulgens
> respicit admirans aversum surgere Taurum
> summisso vultu Geminos et fronte vocantem (1.263 ff.),

aversum is apt. The Ram is depicted as having his body turned to the west, while at the same time he looks back (*respicit*) over his shoulder in wonder (*admirans*), as well he might, at the truncated Bull, who at his rising faces in the opposite direction towards the Twins, and invites them to rise too. Furthermore the Bull's *summisso vultu* indicates that he is looking downwards, i.e. towards and beyond the equator in the direction of the south-east, and therefore in the direction of the Dog.

It may be added that Housman, misled probably by the frequent use of *aversus* in similarly appropriate contexts by his astrological poet, quoted the Vergilian line with *averso* in his note on Manilius 1.399. He thus incurs the suspicion of seeing astrology where there is but astronomy, just as in Lucan 7.1–3 he saw astronomy where there is but mythology.[15] But in Ovid *Met.* 2.80, where Phaethon had asked his father for permission to drive his chariot for a day (i.e. in his diurnal motion from east to west) and Phoebus replied: "per tamen adversi gradieris cornua Tauri," Housman in his note on Manilius 1.264 was undoubtedly right in defending *adversi* against Scaliger's *aversi*.

[14] See Housman, ed. Manil. II, vii.

[15] See his "Astrology in Dracontius," *CQ* 4 (1910) 191 ff. and my ed. of Lucan *De Bello Civili*, 1 (Cambridge, 1940) 141.

B (221 f.)

In 221 the first visible setting of the Pleiades at dawn is obviously intended. This apparent cosmical setting was assigned by Columella to November 8 and described by him thus: "sexto Idus Novembris Vergiliae *mane* occidunt."[16] A little earlier he had mentioned their true cosmical setting, which is not only invisible to the observer, since they set in the morning at the moment when the sun rises, but also takes place previously, i.e. between October 20/21 and 28: "tertio decimo et duodecimo Kalendas Novembris *solis exortu* Vergiliae incipiunt occidere . . . quinto Kalendas Novembris Vergiliae occidunt."[17] Columella's language is equally precise in distinguishing between their apparent heliacal or morning rising on May 10: "Nonis Maiis Vergiliae exoriuntur *mane* . . . sexto Idus Vergiliae totae apparent," and their true but invisible rising with the sun on April 22: "decimo Kalendas Maias Vergiliae *cum sole* oriuntur."[18]

Therefore when the poet says: "ante tibi Eoae Atlantides abscondantur," the epithet *Eoae* strengthened by *tibi* should mean not merely "in the morning" (Conington), but "at dawn before sunrise," and therefore "apparently" or *mane* as distinct from "truly" or *cum sole*. In other words Vergil's *Eoae* is the precise equivalent of Columella's *mane*, and it is curious that Columella himself, in discussing this line elsewhere, seems to ignore *tibi Eoae* ("from your gaze at dawn"), and, in giving the date as October 24, to misunderstand the setting as the true instead of the apparent.[19]

Vergil therefore states that spelt and wheat should not be sown before the apparent cosmical or morning setting of the Pleiades, which took place presumably on November 8 (or 11), and reinforces

[16] 11.2.84. Servius Danielis *ad loc.* agrees, but the date is given by Pliny as Nov. 11 (*H.N.* 2.125; 18.225: cf. *Geop.* 2.14).

[17] 11.2.77 f. Columella's close approximation to accuracy here was attested by Frazer (on Ovid *Fast.* 4.863), who, as usual, faithfully followed his reliable guide Ludwig Ideler, "Über den astronomischen Theil der *Fasti* des Ovid," *Abhandlungen der histor.-philolog. Klasse der Königl. Akademie der Wissenschaften zu Berlin aus den Jahren 1822 und 1823* (Berlin, 1825).

[18] 11.2.39 f. and 36. The date of the apparent rising was May 9 according to the Julian Calendar (Varro *R.R.* 1.28.2), May 11 (Col. 9.14.1 and 4) or May 13 (Ovid *Fast.* 5.599 ff.); but May 10 is supported by Plin. *H.N.* 2.123; 18.248. Frazer on Ovid *loc. cit.* pointed out that at Rome in Ovid's time it actually occurred on May 28, but this date did not appear in the calendars followed by the authors just quoted.

[19] 2.8.1 f. The Loeb translator in his note *ad loc.* fails, like Conington on the Vergilian line, to distinguish between the true and the apparent setting.

this date by mentioning the evening setting of the *stella Coronae*, which is not the whole constellation of Corona Borealis, but its brightest star α which shines in its center.[20] Columella in the passage to which reference has just been made quoted 221 but not 222, and we look in vain elsewhere in him or in Pliny for information about the date of the evening setting of the Crown. But Keightley, who condensed the information given by J. H. Voss, again comes to our rescue:

"According to Democritus and Didymus (*Geop.* 2.14), Ptolemy and Aetius, the Crown *sets* from the 15th of November to the 19th of December. As however Columella (11.2.73), Pliny (18.312 f.) and Hyginus (*Astron.* 5) say that it *rises* in the beginning of October, it was considered by some that the poet had fallen here into an error, which they proposed to emend by making *decedat* signify depart from, sc. the sun, and thus mean *rise*. But this is contrary to the poet's usual employment of this verb: see 450; 4.466; *Ecl.* 2.67."

Keightley might have proceeded from his examples to assert that, when *decedere* is used by Vergil in an astronomical sense, it means only "to set in the evening," except in the unambiguous *Ecl.* 8.14: "frigida vix caelo noctis decesserat umbra." Once this is understood, the language of Vergil is seen to be completely lucid with its precise antithesis between *Eoae* and *decedat* of an apparent morning and evening setting respectively. Indeed he is clearer than his disciple Columella turned poet:

> exspectetur hiems, dum Bacchi Gnosius ardor
> aequore caeruleo celetur vertice mundi,
> solis et adversos metuant Atlantides ortus (10.52 ff.),

where the reader, without either Vergil or some knowledge of the calendar to guide him, might pause and wonder at first whether a morning or an evening setting was intended by *celetur*.[21]

The "error" which Keightley mentioned as having been imputed by other commentators to Vergil seems to have originated with Servius Danielis, and consisted in the belief that the poet meant

[20] So Housman *CQ* 9 (1915) 33. P. d'Hérouville failed to realise this in his superficial *L'Astronomie de Virgile* (Paris, 1940) 9 f., and wrongly criticised Vergil for writing *stella Coronae*.

[21] However, allusions to the revolution of the sky such as Columella's *vertice mundi* (correctly explained by Heyne on *Georg.* 1.222 as "vertigine et circumactione caeli") imply evening rather than morning, cf. Vergil's "vertitur interea caelum et ruit Oceano nox" (*Aen.* 2.250).

not the evening setting of the Crown, but its morning rising, which, according to Columella and Pliny, took place on October 8.[22] But the general sense of the passage and the precise astronomical meaning of *decedat* together forbid this assumption. Vergil goes on to say (i) that any attempt to sow wheat before the setting of the Pleiades (*ante occasum Maiae*) has always resulted in failure, (ii) that the seed-time of vetches, kidney-beans and lentils may be a little earlier, at the setting of Bootes,[23] (iii) that the sowing may be continued until midwinter. The implication is that, although an earlier date than November 8 would be wrong, a later will suffice for the sowing of the wheat. Accordingly the mention of the evening setting of α Coronae may be taken as emphasizing this concession and may therefore be regarded as unobjectionable, so long as Vergil's readers are not too curious about its actual date in his calendar.

Can this date be discovered when so much is unknown? We do not know the year or even the century when such a calendar was constructed; we cannot do more than guess the latitude of the observations on which it was based;[24] we may not even be sure that Vergil was following one calendar consistently. We have seen from Keightley's note that the investigator is faced at the start with a variety of dates vouched for by different authorities and ranging from November 15 to December 19. Those which are said to be based on Ptolemy and are given by Ruelle in Daremberg-Saglio, *Dict. Ant.* 843 f., s.v. "Calendarium," vary on the other hand from November 19 to December 15; while those for the whole constellation of Corona Borealis are still later (*ibid.* 836 f. and 844), namely January 1 (Laurentius Lydus and the Roman calendar) and January 2 (Eudoxus), and the latter date is supported by Haebler in *RE* s.v. "Corona, *στέφανος* als Sternbild" on the authority of Geminus. Thus confusion is worse confounded.

The solitary Vergilian commentator who made an honest though inconclusive attempt to arrive at the probable date with the greatest possible precision was J. H. Voss, who mentioned November 25 on the authority of *Geoponica* 2.14 as that of Didymus for the beginning of the heliacal setting of the Crown in Phoenicia, and November 15

[22] *Loc. cit.* by Keightley, and see below, 34.

[23] See below, 32.

[24] What Housman said of the *συναναπολαί* of Manilius (Ed. V, xxxix) may be taken as equally true of Vergil's risings and settings.

as Ptolemy's earliest occurrence of that of α Coronae. Although he followed Bayer, his authority in estimating the likely dates for the actual setting as November 30 at Alexandria and December 19 at Rome, he rightly observed that the Romans followed Greek calendars; but while in 1789 he contented himself with saying that Corona Borealis set about the end of November, in 1800 he felt constrained to state that its setting probably began in the second half of this month. It would seem that his earlier view was based on the external evidence, his later on a more cautious attempt to reconcile this evidence with Vergil's apparent meaning.

But Vergil himself suggests a clue when he goes on to mention in 229 the evening setting of Bootes, which in poetry may be either the whole constellation or its brightest star Arcturus, just as conversely in the *Georgics* Maia at 1.225 or Taygete at 4.232 represents all the Pleiades. It is far more likely that Arcturus is meant, since the proverbial slowness of the whole of Bootes in setting is unsuitable for a precise date in a calendar. The Herdsman rises quickly on his side, but takes much more time to set feet foremost;[25] and since the Crown is behind his shoulders while Arcturus is beneath his belt,[26] α Coronae in any self-consistent calendar must set considerably later than Arcturus. The morning setting of the latter took place on May 22 and 23 (Columella 11.2.43), May 26 (Ovid *Fasti* 5.733)[27] or June 7 (Pliny *H.N.* 18.255); while the Northern Crown set on July 4 (Columella 11.2.51; Pliny *H.N.* 18.269). The shortest interval between the two settings was therefore one of 27 days on Pliny's reckoning. Since we are told that the evening setting of Arcturus occurred on October 29 (Columella 11.2.78) or October 31 or November 2 (Pliny *H.N.* 18.313), we may conjecture that it preceded the evening setting of Corona Borealis and its bright star by a similar number of days.

I am indebted to Dr. Frank S. Hogg, Professor of Astronomy in the University of Toronto and Director of the David Dunlap Observatory at Richmond Hill, Ontario, for his kindness in check-

[25] Cf. Arat. *Phaen.* 608 f. with *ibid.* 579 ff., where it is said that his setting time synchronizes with that of four signs of the zodiac. The slowness of Bootes in setting is a commonplace of ancient literature from Hom. *Od.* 5.272 onwards.

[26] Arat. *Phaen.* 94 f.; Eratosthenes *Cataster.* 8; Hygin. *Astron.* 3.3.

[27] Here named Bootes. Ovid's other date (March 5) for this phenomenon, as given in *Fast.* 3.405 f., is a mistake for that of the evening rising.

ing[28] the intervals between the heliacal settings of Arcturus and of α Coronae for the approximate latitudes of Rhodes and Rome, namely 36° and 42°. The calculations were made with respect to Vergil's own time, but the differences over two or three centuries for the latitudes of Alexandria, Phoenicia, Rhodes or Rome are inconsiderable. In both instances α Coronae was found to set approximately 27 days after Arcturus, which is Pliny's interval for the cosmical settings. Taking Columella's date, October 29, for the evening setting of Arcturus, we arrive at November 25 for the probable setting of the *stella Coronae* in the same calendar; and this, as we have seen, is the date given by Didymus.

The most conservative conjecture, therefore, means that approximately seventeen days elapsed between the morning setting of the Pleiades and the evening setting of α Coronae in the calendar which Vergil presumably followed, provided that Columella's date for the former phenomenon is accepted. On other computations the interval is increased. It may be replied in Vergil's defense (i) that this presumed interval of seventeen days is longer by only four days than that between the entry of the sun into Taurus and the evening setting of Sirius in 217 f., (ii) that we have similarly no right to expect the events of 221 and 222 to be exactly contemporaneous. Nevertheless in themselves these two lines look like parallel and complementary attempts to fix a precise date; and it would seem that Columella thought so too, for we have noticed that in his poetical imitation (10.52 ff.) he mentioned the same two phenomena in reverse order, putting the evening setting of Corona Borealis before the morning setting of the Pleiades, and so letting them both describe the coming of winter. But only here did Columella venture to allude to the Crown's evening setting, for all mention of either its evening rising or its evening setting is markedly absent from the lists in his eleventh and Pliny's eighteenth books, and also in his discussion of the Vergilian passage in 2.8.1 f. he suppressed line 222 altogether. To have to seek information about the date of any Vergilian rising or setting elsewhere than in him or Pliny is unique.

On the other hand Columella and Pliny do mention clearly and explicitly the dates of the morning rising (October 8) and setting

[28] With the help of P. V. Neugebauer, *Astronomische Chronologie* (Berlin and Leipzig, 1929), for arcs of visibility.

(July 4) of Corona Borealis and its brightest star. Their information about the morning rising is especially interesting:

> Columella 11.2.73 f.: Octavo Idus Octobris Coronae clara stella exoritur. Sexto Idus Octobris Vergiliae exoriuntur vespere . . . Tertio et pridie Idus Octobris Corona tota mane exoritur.
>
> Pliny *H.N.* 18.313: Octavo Idus Octobris Caesari fulgens in Corona stella exoritur, et sexto Idus Vergiliae vesperi, Idibus Corona tota.

Here the morning rising of α Coronae is placed by each authority two days before the evening rising of the Pleiades, which in its turn is said to precede the morning rising of the whole of Corona Borealis by a few days. Now this astronomical coincidence was so striking as probably to be similarly conspicuous in most catalogues. This hypothesis, rather than the more artless allegation of simple confusion between the evening setting and the morning rising, may explain the cause of Vergil's error, if error there be. Since his language implies fairly close correspondence in time between two phenomena which in fact do not synchronize very satisfactorily, it is tempting to conjecture (i) that the poet assumed from the small interval of two days between the celestial events of October 8 and 10 that the morning setting of the Pleiades and the evening setting of the Crown's bright star would behave with equally appropriate synchronization, (ii) that Columella and Pliny were both so embarrassed by this assumption that they preferred to suppress any allusion to the date of the setting of α Coronae rather than admit a discrepancy between the standard calendars and the poet who had enabled Roman agriculture to express itself in poetry.[29]

II

> bis gravidos cogunt fetus, duo tempora messis:
> Taygete simul os terris ostendit honestum
> Plias et Oceani spretos pede reppulit amnis,
> aut eadem sidus fugiens ubi Piscis aquosi
> tristior hibernas caelo descendit in undas. (4.231 ff.)

The question whether this passage should be postponed to a position after 238 infra, as suggested by Bentley, Schrader, Ribbeck

[29] Col. 1.1.12: "Vergilium, qui carminum quoque potentem fecit (agricolationem Romana civitate donatam)." When Columella (2.8.1 f., see note 19) thought Vergil meant the true rather than the apparent cosmical setting of the Pleiades, he thereby increased the interval of time which separated it from the evening setting of α Coronae and embarrassed himself still further.

and others, is not necessary to the elucidation of the last four (and especially the last two) lines, and may be ignored.

In his statement that honey should be gathered twice a year Vergil followed Aristotle (*H.A.* 9.40: *τῇ δὲ τοῦ μέλιτος ἐργασίᾳ διπλοὶ καιροί εἰσιν, ἔαρ καὶ μετόπωρον*) rather than Varro (*R.R.* 3.16.34), who named three annual collections.[30] Also, in choosing the apparent heliacal or morning rising (232 f.)[31] and the apparent cosmical or morning setting (234 f.) of the Pleiades to date these two seasons, he was influenced by Hesiod's precept regarding harvest and seed-time:

> Πληιάδων Ἀτλαγενέων ἐπιτελλομενάων
> ἄρχεσθ' ἀμήτου, ἀρότοιο δὲ δυσομενάων
> (*Op.* 383 f.),

and thinking of the command which Aratus said was given to the seven stellar sisters by Zeus:

> ὅ σφισι καὶ θέρεος καὶ χείματος ἀρχομένοιο
> σημαίνειν ἐκέλευσεν ἐπερχομένου τ' ἀρότοιο
> (*Phaen.* 266 f.),

i.e. that the beginning of summer and of winter should be indicated by their heliacal rising and cosmical setting,[32] which, as we have noted above, took place according to Columella on May 10 and November 8 respectively.

But what of "sidus fugiens Piscis aquosi," and where and what is this watery Fish? The complication which the poet introduces formerly troubled commentators more than it does now, and Heyne devoted an Excursus to it (*De Pleiade Piscem fugiente*) without finding a satisfactory solution. The long history of misinterpretation of these words begins with Servius (and Servius Danielis here printed in italics): "Australem Piscem significat, qui Aquarii undam ore suscipit — unde etiam 'aquosi' addidit — : tunc enim hic piscis oritur, quo tempore *tendere in occasum Pliades coeperunt: nam ideo*

[30] Like Didymus in *Geop.* 15.5; but Col. 9.14.11; 9.15.1 (cf. 9.14.5; 11.2.50 and 57) and Plin. *H.N.* 15.38 ff. speak of two collections only, and Pall. 7.7 of one.

[31] He has made it clear with "os terris ostendit honestum" that he meant the apparent and not the true rising, and this is confirmed by Heyne's parallel, Theocr. 18.26: *Ἀὼς ἀντέλλοισα καλὸν διέφαινε πρόσωπον* of the dawn *before* sunrise. Similarly "tristior" implies that the Pleiad is seen by men as she sinks regretfully into the wintry waves.

[32] Cf. Theophr. *De Signis* 1.6: *διχοτομεῖ δὲ τὸν μὲν ἐνιαυτὸν* Πλειάς *τε δυομένη καὶ ἀνατέλλουσα*, Arat. *Phaen.* 1065 f., 1084 f.; Ovid. *Fast.* 5.599 ff.; Col. 11.2.84; Plin. *H.N.* 18.309; etc.

ait 'fugiens.'" This is erroneous.[33] The Southern Fish, Piscis Australis or Notius, does not rise when the Pleiades are westering, for it lies longitudinally not to the east but to the west of them; and its distance from them is considerably more than that represented by the two zodiacal signs, Aries and Pisces, for ancient star maps depicted Aquarius, the Water-Carrier, pouring his cargo from his tilted urn into its mouth. Indeed this longitudinal distance approximates more closely to that of three signs of the zodiac or a quarter of the heavens,[34] so that Piscis Australis is really nearing the meridian below the earth when the Pleiades are setting. In other words, the distance of the Southern Fish is too far in the wrong direction, or not far enough, to cause the Pleiades any distress, either by rising and setting in their proximity, or by rising when they are setting.[35]

When De la Rue (1675) suggested that the "sidus Piscis aquosi" is Hydra, or Martyn (1741) that it is Delphinus or the Dolphin, their absurdities deserve no further comment.[36] And when Dryden translated the two Vergilian lines thus:

> Again when their affrighted quire surveys
> The wat'ry Scorpion mend his pace behind
> With a black train of storms and winter wind,
> They plunge into the deep, and safe protection find,

his deliberate error was typical of an age which was interested "in the subject matter rather than the form of the classics";[37] for in cutting the knot so drastically as to make the watery Fish the

[33] Servius Danielis, however, is right in calling attention to the astronomical meaning inherent in *fugiens* ("setting"): cf. the astrological sense of Manil. 2.794: "unde fugit mundus praecepsque in Tartara tendit" etc.

[34] Aratus (*Phaen.* 386 ff.; 702) put Piscis Notius beneath or south of Capricornus. See Housman on Manil. 5.394–408, and cf. *id.* 1.438 ff. In A.D. 100 the longitude of Taygete was 33° 8′ and that of Fomalhaut, the chief star of Piscis Australis, 307° 14′: therefore their longitudinal separation was 85° 54′. In 130 B.C. the figures were respectively 29° 58′, 304° 3′ and 85° 15′: therefore in 29 B.C. Taygete and Fomalhaut were approximately 85° 32′ apart longitudinally. See Peters and Knobel, *Ptolemy's Catalogue of Stars: a Revision of the Almagest* (The Carnegie Institute of Washington, 1915) esp. 60, 73, 82, 95.

[35] Ideler (as quoted by Heyne-Wagner 633) showed that in Vergil's time the acronychal or evening rising of Piscis Australis took place on August 30 and the cosmical or morning setting of the Pleiades on November 12, so that there can be no relationship between these two phenomena to justify *fugiens*.

[36] Even these are not so ridiculous as the reading cited by Barth *Adv.* 37.6: "Piscis amores"!

[37] M. L. Clarke, *Greek Studies in England 1700–1830* (Cambridge, 1945) 1.

Scorpion, he tried to replace what he found unintelligible by an explanation intelligible both in myth and in astronomy. Vergil's "(Plias) fugiens . . . descendit in undas" is obviously a verbal reminiscence of Hesiod's

> εὖτ' ἂν Πληιάδες σθένος ὄβριμον Ὠαρίωνος
> φεύγουσαι πίπτωσιν ἐς ἠεροειδέα πόντον
> (*Op.* 619 f.),

but here Orion, who sets after the Pleiades, is an appropriate pursuer.[38] Orion in his turn was often portrayed as fleeing from the Scorpion which punished him for his attempt on Artemis, and setting in the west when it is rising in the east.[39] Dryden also knew that the sun is in Scorpius at the time both of the true and of the apparent cosmical setting of the Pleiades. His game of catch as catch can is therefore ingenious and partly justified by Columella 10.54: "solis et adversos metuant Atlantides ortus,"[40] but it is not what Vergil describes here.

We have not far to look for a more convenient Fish than any of these creatures just mentioned, for we see not merely one but two in the zodiacal constellation Pisces. De la Cerda perceived this, and the majority of subsequent editors have tended to follow him. The more discerning, however, have realised that any mention of Pisces, which sets before the Pleiades, is relevant only if they understand by it the time of year when the sun is in that sign or constellation. But this does not happen for more than three months after the cosmical setting of the Pleiades, for the sun is in Pisces from February 15 until March 17,[41] on which latter date spring succeeds winter in Ovid's reminiscence of our Vergilian line: "quotiensque repellit | ver hiemem, Piscique Aries succedit aquoso."[42] They therefore explain Vergil's "sidus Piscis aquosi"

[38] Cf. Quint. Smyrn. 5.367 f.: Πληιὰς εὖτ' ἀκάμαντος ἐς Ὠκεανοῖο ῥέεθρα | δύεθ' ὑποπτώσσουσα περικλυτὸν Ὠρίωνα. Heyne-Wagner 634 mention that G. Costard, *The History of Astronomy* (London, 1767) 90, conjectured: "aut eadem sidus fugiens Orionis aquosi," understanding *simul* from 232, but of course violating the metre.

[39] Arat. *Phaen.* 634 ff.; *Ciris* 535; Ovid. *Fast.* 5.541 ff.; Hygin. *Astron.* 2.26. See Frazer on *Fast.* 5.537 and Küentzle in Roscher's *Lexikon* 3.1043 ff. s.v. "Orion."

[40] Columella also (11.2.78) makes the true setting of the Pleiades on Oct. 28 follow the rising of the Scorpion two days previously.

[41] Ovid *Fast.* 2.457 f.; Col. 11.2.20 and 31.

[42] *Met.* 10.164 f., where the singular is likewise used for the plural. Voss compares *Trist.* 4.7.1 f.: "bis me sol adiit gelidae post frigora brumae, | bisque suum tacto Pisce peregit iter." The epithet *aquoso* is ornamental, cf. Manil. 1.273: "Piscibus assuetas avide subeuntibus undas."

as a general expression for winter,[43] but they forget that the Romans sometimes regarded spring as beginning on February 8 (Pliny *H.N.* 2.122) or February 9 (Ovid *Fasti* 2.150), and that Vergil himself spoke of the period when the sun is advancing into Aquarius and causing it to set after him (i.e. the second half of January) as the end of the year:

> cum frigidus olim
> iam cadit extremoque inrorat Aquarius anno (3.303 f.).

Even if this were not so, to believe that the poet described winter generally, or at any rate its commencement, by a phrase more suited to its end is to credit him with an uncouth synecdoche. Otherwise, if the Pleiades in early November dive into the sea to escape a phenomenon which does not take place until the second half of February, they are unseasonably timid.

The despairing citation by P. d'Hérouville[44] of the formula *adhuc sub iudice lis est* in lieu of explanation echoes Forbiger's remark nearly a century earlier: "liti dirimendae non nisi astronomos idoneos censeo." What is needed, however, is a knowledge, not so much of astronomy, as of the errors to which Latin poets in their meager knowledge of astronomy were prone.

One turns again to Keightley and finds the following explanation: "He (Vergil) says that the Pleias flies from the Fishes, because in the tables of the celestial signs which the ancient astronomers constructed, the hinder part of Taurus (in which the Pleiades are situated) is turned towards Aries, after which comes Pisces." This, however, is but part of the truth, and Keightley has failed to develop it. Had he paid closer attention to Vergil's authority, Aratus, he might have done so and incidentally modified his remark between the parentheses.

If the expression "sidus fugiens Piscis aquosi" means, as it must, "fleeing before the sun in Pisces," it is quite unsuited to the cosmical setting in early November, when the sun is rising in Scorpius. Now, if the *Georgics* were known to us only in Dryden's translation, there would be no difficulty. But in mentioning Pisces Vergil has introduced a sign which is somewhat more appropriate to the

[43] E.g. Lejay (1920): "*Piscis:* le signe du zodiaque, qui correspond au mois de mars-avril, mais qui, comme ailleurs le Verseau, désigne ici la mauvaise saison en général. Cf. *hibernas undas.*"

[44] *Op. cit.* (above, note 20) 12 f.

heliacal or evening setting of the Pleiades on April 5 or 6;[45] although, even if this hypothetical error is granted, he is still inexact. By these dates the sun is no longer in Pisces, but in Aries, which he enters on March 17.[46]

The major and the minor error are both easily explained. Vergil has confused the morning (cosmical) and the evening (heliacal) settings of the Pleiades, and although he meant to describe the former phenomenon, he has used language suggestive of both. For a Roman poet to confuse either risings or settings or both was all too easy, when he took them without discrimination or understanding from a calendar to serve as "a traditional ornament of poetic style."[47] Hesiod was a practical farmer, and to him they had a real significance, but to Vergil they were only items in a calendar.

Similar confusion is frequent in the *Fasti* of Ovid, whose "scilicet arma magis quam sidera, Romule, noras" was no more philistine than Vergil's famous repudiation of art and science in favor of imperialism in the Sixth *Aeneid*.[48] We need not be surprised that a poet who could write, regardless of astronomy and language: "septimus hinc oriens cum se demiserit undis,"[49] should proceed in the next couplet to tell us that by January 24 the star which we now call Regulus will have set heliacally (i.e. in the evening), and so be more than five months out in his chronology; whereas this date is really an approximation to that of the cosmical or morning setting.[50] Furthermore in *Fast.* 4.165 ff. his error (unnoticed by Frazer) was the opposite of Vergil's, for he made the Pleiades set on April 2 in the morning instead of the evening. Examples in the *Fasti* could be multiplied,[51] but these may suffice.

But why did Vergil in his moment of aberration apparently think of the sun as being in Pisces instead of Aries when the Pleiades set in the evening? He may have been thinking of Taurus, not Aries, as the first of the signs, since he could say that the sun on

[45] Col. 11.2.34; Plin. *H.N.* 18.246.

[46] Col. 11.2.31: see Frazer on Ovid *Fast.* 3.851. According to Pliny, *loc. cit.* (above, note 45), the vernal equinox is over on March 25.

[47] Nilsson, *op. cit.* (above, note 9) 110.

[48] *Fast.* 1.29; *Aen.* 6.847 ff.

[49] *Fast.* 1.653. Cf. his *subsedit* where he meant "has risen" in 2.457 f.

[50] See Frazer on 1.655.

[51] E.g. 1.311 ff.; 2.77 f., 145, 243 f.; 3.711 f.; 4.904 (see above, note 6); 5.164; 6.719 f. and Frazer *passim*.

entering it opened the year (1.217). Had he forgotten the initial place which Aries occupied in the zodiac? There is every reason to believe that he had overlooked it, for he was following Aratus, who could easily mislead one who knew even less about astronomy. After the description of the Ram in *Phaen.* 225 ff. Aratus alluded to him again in 238 as being south of the Triangle, and went on in the next line to remark ambiguously that the Fishes are προτέρω, which is true in respect of the apparent diurnal movement of the sky, but false regarding the direction of the zodiac and the sun's path through it. The Fishes are then described in 240 ff., and the observer is taken thence to the Pleiades (254 ff.), without further mention of the intervening Ram, by a route which curves over his head and back, and also over the Triangle, via the left shoulder and feet of Andromeda, and then along her bridegroom Perseus down to his left thigh. Now neither in this passage nor in 167 ff. where the Bull is discussed did Aratus regard the Pleiades as forming part of Taurus.[52] Therefore in ignoring the zodiacal Aries when he thus related the position of his extra-zodiacal daughters of Atlas to that of the zodiacal Pisces, he misled the poet of the *Georgics* into grafting this gratuitous mention of an inappropriate zodiacal sign upon an otherwise clear allusion to the morning setting of the Pleiades. In other words Vergil's watery Fish is but a red herring!

III

> iam rapidus torrens sitientis Sirius Indos
> ardebat caelo, et medium sol igneus orbem
> hauserat: arebant herbae, et cava flumina siccis
> faucibus ad limum radii tepefacta coquebant. (4.425 ff.)

Conscious that Vergil's choice of language can hardly have been so naive as to let Sirius blaze in the noonday sky, commentators are virtually unanimous in seeing an allusion to the Dog Days or period introduced by the heliacal or morning rising of this star in the second half of July, just after the sun entered Leo.[53] Thus "iam rapidus torrens sitientis Sirius Indos | ardebat caelo" indicates the season of the year and "et medium sol igneus orbem | hauserat" the time of day when Proteus went ashore to take his siesta

[52] Housman on Manil. 1.371 f.

[53] Plin. *H.N.* 18.269, where the meaning seems to be that the sun entered Leo on the 23rd day after the summer solstice on June 24 (*ibid.* 264), and that Sirius rose on July 19. Col. 11.2.53 assigns the latter event to July 26, but the small discrepancies in the dates do not affect the general argument.

in his cave. The meaning of *medium orbem* ("the middle of his diurnal course") would seem to be clear from Cyrene's promise in an earlier passage (4.401 ff.) to Aristaeus that she would conduct him thither in the noontide heat, when the grasses are parched:

> ipsa ego te, medios cum sol accenderit aestus,
> cum sitiunt herbae et pecori iam gratior umbra est,
> in secreta senis ducam,

and to be confirmed by the descriptions of passing midday and approaching midnight respectively in *Aen.* 8.97: "sol medium caeli conscenderat igneus orbem" and *Aen.* 3.512: "necdum orbem medium Nox Horis acta subibat."

But why does the pluperfect *hauserat* occur amid three imperfects, *ardebat, arebant* and *coquebant?* Such a pluperfect describes prior action, like *excierat* among its attendant imperfects in *Aen.* 5.104 ff.:

> exspectata dies aderat nonamque serena
> Auroram Phaethontis equi iam luce vehebant,
> famaque finitimos et clari nomen Acestae
> excierat: laeto complebant litora coetu.

It may be said that *hauserat* defines the time of day exactly by suggesting that noon was already past. But this is not the whole explanation. Implicit in the passage and inherent in *hauserat* lurks an additional meaning which Frazer noted but left undeveloped in his comment on Ovid *Fasti* 1.379. According to Columella,[54] who quoted Democritus and Mago as well as Vergil, "the spontaneous generation of bees in the putrefying carcass of an ox" could take place "between the summer solstice and the rising of the Dog Star (Sirius), a period which, according to the manuscripts, he reckoned at thirty days." As Frazer rightly added, Vergil had the same time of the year in mind. Now the pluperfect *hauserat* means that the sun had previously exhausted or passed the middle of his course, and the *double entendre* of midday and midsummer in "et medium sol igneus orbem | hauserat" becomes as clear to us as it was to Ovid when he made it explicit in *Met.* 10.126 f.: "aestus erat mediusque dies, solisque vapore | concava litorei fervebant bracchia Cancri."[55] It is of little concern whether Vergil took the Julian

[54] 9.14.5 f.

[55] Columella's imitation shows that he too understood Vergil's latent meaning: "sed cum maturis flavebit messis aristis | atque diem Gemino Titan extenderit astro, | hauserit et flammis Lernaei bracchia Cancri" (10.311 ff.).

calendar as his authority for the occurrence of the summer solstice on June 24 at the 8th point of Cancer,[56] five days after the sun left Gemini and entered Cancer as described by Ovid: "sol abit a Geminis et Cancri signa rubescunt,"[57] or whether he followed Hipparchus in regarding it as coinciding with the sun's entrance into Cancer. What does matter is that by *medium orbem* he meant the halfway mark between the equinoctial points in the semicircle described by the ecliptic north of the celestial equator and within the zodiac from the relevant point of Aries to the corresponding point of Libra. Thus the full implication of lines 425–7 is that the solstice had come and gone and the Dog Days had now arrived; and if the familiar arrangement known as ὕστερον πρότερον puts the initial after the final date for the spontaneous generation of bees, the meaning is safeguarded by the deliberate choice of the tenses of *ardebat* and *hauserat.*

In placing the oracular seat of Iuppiter Hammon beneath the Tropic of Cancer, Lucan wrote (9.531 f.):

> deprensum est hunc esse locum qua circulus alti
> solstitii medium signorum percutit orbem.

Housman[58] may possibly have been right in believing that this poet was precise enough to mean by *circulus alti solstitii* the *circulus aestivus* or tropic of Cancer rather than the colure of the solstices or meridian circle of the heavens which passes across the poles and through both solstitial points; but he erred in refusing to take *medium* with *percutit* as predicative. "A circular line," he observed, "has no middle," and therefore he argued that *medium signorum orbem* is the zodiac in the center of the heavens, coming no nearer to one pole than to the other. But the editor of Manilius forgot that one circular line can divide another in the middle, if the point of intersection is defined and the extent of the arc is implied by the context; for in that poet the solstitial intersects the equinoctial colure at the north celestial pole as follows: "alter in hunc medium summumque incumbit in axem."[59] Lucan almost certainly was influenced by Vergil here, and regarded *alti* as sufficient within his

[56] Plin. *H.N.* 18.264 (see note 53); Mart. Cap. 8.833. According to Col. 11.2.49 it took place on June 24, 25 and 26. See Frazer's ed. of the *Fasti* of Ovid, vol. iv, 333, note 3.

[57] *Fast.* 6.727, cf. Col. *loc. cit.* (above, note 55).

[58] Astronomical Appendix to his ed. of Lucan (Oxford, 2nd impr. 1927) 330.

[59] 1.618.

context to define the semicircular range of the *orbem signorum* north of the equator.[60]

IV

The Roman poets attest unconsciously how complete was the stagnation into which astronomy had lapsed. We may have ceased to join Heath in complaining that Aristarchus of Samos was so far ahead of his time that his heliocentric theory found no followers,[61] but we may still regret that with most cultured Romans the popularity of Aratus was the measure of their scientific knowledge of the heavens.[62] The reactionary influence of Epicureanism may be gauged from "the strange mixture of true science and childish theorizing" which characterizes the disappointing astronomical digression of Lucretius;[63] and it may be conjectured that Vergil learned as much and as little from his teacher Siro. The rival school of philosophy did little more to advance understanding of astronomy in Rome, and "when Stoic poets (like Lucan) talk astronomy they usually expend more words and less thought than one could wish."[64] Even when a Roman poet like Manilius undertook to write specifically about the subject, or like Ovid catalogued various risings and settings, mistakes occurred in profusion, as reference to the editions of Housman and Frazer respectively will show.

The charm of Vergil's language and his appeal to the Muses to teach him astronomy[65] should not make us predisposed to believe

[60] Elsewhere Lucan showed less knowledge than Columella (note 55) in his use of the Vergilian passage. He apparently assumed that in "iam . . . caelo" and "et . . . hauserat" the same time of the year and the same place of the sun in the zodiac were implied, and proceeded to write: "medios ignes caeli rapidique Leonis | solstitiale caput" (6.337 f.), and also: "pars caeli . . ., qua mixta Leonis | sidera sunt Cancro, rapidos qua Sirius ignes | exerit et varii mutator circulus anni | Aegoceron Cancrumque tenet" (10.210 ff.), where "varii mutator circulus anni" would suggest that in 9.531 f. he was thinking after all (*pace Housmanni*) in his muddled way of the northern half of the solstitial colure (*alti* being an easy hypallage) and not of the tropic of Cancer, and where in animadverting upon the confusion between dates and longitudes Housman might have added misunderstanding of Vergil to the other causes of Lucan's error.

[61] See William Harris Stahl, "The Greek Heliocentric Theory and its Abandonment," *TAPhA* 76 (1945) esp. 321 ff.

[62] Yet despite admiration of his merits as a poet, his translator Cicero was aware of his defects as an astronomer: see *De Orat.* 1.16.69.

[63] 5.509 ff. See Harry Joshua Leon, "Astronomy in Lucretius," *Classical and Mediaeval Studies in Honor of Edward Kennard Rand* (New York, 1938) 161 ff., whence this quotation is borrowed.

[64] Housman, *loc. cit.* (above, note 58).

[65] *Georg.* 2.475 ff.

without scrutiny that he was necessarily more scientific than his fellows. Ever since Macrobius wrote of him that he was one "quem nullius umquam disciplinae error involvit,"[66] his omniscience has been taken for granted by many of his admirers. A fair sample of this uncritical attitude may be seen in the five undiscerning pages which even a Delambre[67] could devote to him, but which do nothing for his interpretation. Mackail did his best to defend *surgere* in *Aen.* 6.453 of the new moon when first visible, but his obiter dictum: "His (Vergil's) observation of nature, if not as impeccable as Wordsworth's, is almost uniformly accurate" will hardly hold good for a poet who, whether guided or not by convention, allowed Damon to allude in his song to the appearance of both the morning and the evening star for the wedding of Mopsus and Nysa.[68] Vergil's unnamed critics, with whom Metrodorus the philosopher is said on the authority of Servius[69] to have disagreed, may not have been so wrong after all when they found fault with the poet's ignorance of astronomy ("frustra culpari a plerisque Vergilium quasi ignarum astrologiae"); but few modern scholars have been so frank as Housman,[70] who has referred to the suspected confusion of the zodiac with the equator in *Ecl.* 10.68,[71] and, worse still, with the tropic of Cancer in *Aen.* 6.795 ff., where Atlas seems to be placed south of the sun's path.

Yet the choice of the epithet *adverso* in 1.218 would imply that Vergil was familiar with imaginative drawings of the constellations,[72]

[66] *Somn. Scip.* 2.8.1.

[67] J. B. J. Delambre, *Histoire de l'Astronomie Ancienne*, I (Paris, 1817) 326 ff.

[68] *Ecl.* 8.17 and 30, though the cruder astronomy of Cinna (Serv. Dan. on *Georg.* 1.288) was probably Vergil's immediate model: "te matutinus flentem conspexit Eous | et flentem paullo vidit post Hesperus idem." Keightley, who compared also Cat. 62.34 f.; Hor. *Carm.* 2.9.10 ff.; Sen. *Phaedr.* 749 ff., *Oed.* 740 ff.; Stat. *Theb.* 6.238 ff. for this faulty astronomy, remarked more truthfully than Mackail: "It is strange how inobservant of nature the ancient poets frequently were." For Vergil's error see L. Havet in *Comptes Rendus de l'Académie des Inscriptions* (1914) 22 and in *RPh* 38 (1914) 87 f. Homer and Hesiod do not seem to have suspected the identity of the Morning and the Evening Star, see A. W. Mair, *op. cit.* (above, note 9) 108 f.

[69] On *Georg.* 1.229.

[70] *Op. cit.* (above, note 58) 328 f. and 336.

[71] Unless Vergil's meaning is not astronomical and geographical, but astrological. See Housman, *op. cit.* (above, note 58) 337, who compared Manil. 4.758 and Dorotheus ap. Heph. Theb. 1.1. p. 52. 12 Engelbr. for the domination by Cancer of Ethiopia.

[72] Cf. the discussion of Manil. 1.431–42 by James R. Naiden and Fred W. Householder, Jr., in *CPh* 37 (1942) 187 ff., especially their words: "Manilius was surely familiar with imaginative drawings of the constellations, probably in some sort of planisphere."

and though in 4.425 ff. we cannot tell whether he was thinking for himself or merely copying some unknown authority, the precision of his language was too detailed and too subtle for either Lucan or modern exegesis. Accordingly, let him earn higher marks for astronomical accuracy than other Roman poets. It is fitting, therefore, that this discussion of such cruces in the *Georgics* should end as it began, not with the detection of errors which his professed interpreters have ignored, but with a vindication of a line which they have misunderstood. In 3.351: "quaque redit medium Rhodope porrecta sub axem," it should be realised that Rhodope, lying as it does for the nonce beneath the celestial north pole which is in the middle of the sky ("medium sub axem"), "redit" across the terrestrial north pole,[73] just as in Manilius the equinoctial colure "redit" across the celestial south pole:

> adverso concurrit rursus in axe
> et redit in caelum. (1.613 f.)

Here Vergil had a clearer idea of his cosmology than one would imagine from the remarks of Servius and later commentators.

[73] For *redit* of motion from the known towards the unknown half of the world cf. 1.249: "aut redit a nobis Aurora, diemque reducit." Forbiger's note on 3.351 left his successors as indifferent as it leaves us uncertain whether he saw the meaning there or not: "Noli tamen putare *redire* idem significare posse, quod procedere. Imo *redire* hic respicere videtur curvum, inflexum montis tractum, qui a meridie ad septentrionem porrectus, inde semicirculum ducens meridiem versus redit (*sich herumzieht*)."