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Aratus: the Reverent, the Referent

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erected, *a sanctuary must be shattered*".¹⁴ Here Nietzsche seems to imply that the destruction would occur before the advent of such a strong-willed individual and thus the "younger one" will be free to construct a new sanctuary.¹⁵ What, it would be instructive to ask, will this *superman* erect over the rotting ruins of this ancient sanctuary? The answer is not so clear – uncharacteristically, Nietzsche remains silent. He is nowhere to be found: "But what am I saying? Enough! Enough! At this point there is only one thing fitting for me, to be silent: otherwise I would be laying a hand on that which only a younger one is free to choose".¹⁶ Thus Nietzsche disappears at a time which seems to be most opportune for him to shape exactly what those future ones will uphold. That, however, is the essence of the theory. The importance of Section 25 of the 2nd *Treatise* is precisely Nietzsche's silence: he realizes that should he lay a hand to such formation, he becomes a hypocrite. Instead, Nietzsche leaves his *übermensch* with nothing but a mirror and ruins – free to create what he needs and powerful enough to oppose what he sees as wrong. Here we find the answer to a paradox that seems to pervade Nietzsche's writing: thinking for yourself means going beyond even Nietzsche's philosophy and building your own temple. Because we cannot define such a creature by what he will stand for, we must define him by what he opposes.

The *übermensch* will oppose modes of thinking which develop submission to ascetic ideals and discourage independent thinking. He will oppose the idea of "herd-mentality" because it is a comfortable alternative to independent thinking and a form of

¹⁴ Ibid., 65.

¹⁵ Ibid., 66. For the construction of a new sanctuary, see Ibid., 65.

¹⁶ Ibid.

moral control, but above all because it encourages "ressentiment".¹⁷ Our *sovereign individual* will also oppose the ideal-finding aspect of science and understand that truth is multi-faceted: for there is "only perspectival seeing, only a perspectival 'knowing'... the more eyes[,]... the more complete will our 'concept' of this matter, our 'objectivity' be".¹⁸ This is perhaps the only constructive idea we have for the *übermensch*, and it is instructive to notice that the idea is introduced in context of his *opposition* to one set truth. The *übermensch*, perhaps most importantly, will oppose ascetic ideals giving him a will to power rather than a will to nothingness.¹⁹ In pursuit of this goal he, in his creative capacity, will resemble an artist who, through creation, makes an "attempt truly to be" through opposition.²⁰ These examples of opposition are our only gauges of this *übermensch*, because – in paradoxical form – what he stands for is his to create from that which is destroyed.

*In The Destructor's absence,
Glaucou and I slowly began sifting
through the rubble – choosing what
we needed to keep and what we felt
should be left on the ground. We
understood now. What surprising
freedom it was to boldly build our
own temple anew! – and, on its
pinnacle we placed the mirror
which started it all. What good air
surrounded us! What cold, harsh,
beautiful air!*

¹⁷ Ibid., 98. For further discussion of comforts and "hypnotic general suppression of sensitivity" (Ibid., 97) see Section 18 of 3rd *Treatise* in Ibid., 97-8.

For his resistance to "ressentiment", see Ibid., 89.

¹⁸ For Nietzsche's attacks on science see sections 24 and 25 of 3rd *Treatise* in Ibid., 108-113. He sees science as a means of "self-anesthetization" (Ibid., 108). Quote on multi-faceted facts, Ibid., 85.

¹⁹ "will to power", Ibid., 98; "will to nothingness", Ibid., 118.

²⁰ Ibid., 70.

Aratus

The Reverent, The Referent

Emily A. Wolford

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"All these constellations thou canst mark as the seasons pass, each returning at its appointed time: for all are unchangingly and firmly fixed in the heavens to be the ornaments of the passing night (451-454)."

In his 1996 book, *The Demon – Haunted World: Science as a Candle in the Dark*, Carl Sagan, the great American astronomer and champion of popularizing the field of astronomy, wrote:

Science is not only compatible with spirituality; it is a profound source of spirituality. When we recognize our place in an immensity of light-years and in the passage of ages, when we grasp the intricacy, beauty, and subtlety of life, then that soaring feeling, that sense of elation and humility combined, is surely spiritual [Sagan 1996:29].

Over two thousand years separate this fine twentieth century astronomer from Hellenistic Greece, a three hundred year time span that began in the third century BCE and reached its culmination with the rise of the Christian era. Despite this fact, Sagan's perspective concerning the affirmation of finding spirituality through the means of science, through "recognizing our place . . . in the passage of ages" (Sagan 1996: 29), is no more clearly relevant than in the *Phaenomena*, written by Aratus in Hellenistic Greece around 275 BCE. Aratus' *Phaenomena* consists of 1,154 lines of dactylic hexameter on the heavens and celestial

occurrences and effects. Over the course of the *Phaenomena*, Aratus outlines the location of the constellations in his presentation of the sky, the orientation of the Earth, the "belts" of the equator, Tropics, and ecliptic, and finally of earthy weather effects that foretell omens for his audience. However, Sagan's intentions are best appropriate for Aratus' discussion concerning celestial observances and the orientation of the Earth, for it is during these particular passages that Aratus successfully weaves the spiritual – that of mythology, religion, and Zeus – with the scientific – that of the ecliptic, an axial Earth, heliacal risings and settings, and the celestial sphere – in order to create a fascinating work of poetry that continues to preserve the heavens and celestial appearances as perceived by the ancient Greeks.

One of the clearest examples representing Sagan's concept of linking the spiritual with the scientific occurs during the first 20 lines of the *Phaenomena* wherein Aratus writes, "From Zeus let us begin; him do we mortals never leave unnamed; full of Zeus are all the streets and all the market-places of men; . . . always we all have need of Zeus. For himself it was who set the signs in heaven, and marked out the

constellations” [translation by Mair (1955:1-11)]. Before Aratus describes even one constellation, he invokes the hymnic style contemporary of Hellenistic poetry as he praises Zeus for both mankind and the heavens. This hymnic style is achieved through the poem’s first three words: “Ἐκ Διὸς ἀρχώμεσθα (From Zeus let us begin)” [translation by Mair (1955: 1)]. Throughout the entirety of the *Phaenomena*, Zeus (Ζεύς, Διός, ὁ) never functions as the subject of his own clause in the Classical Greek. This is done possible to denote deference towards him, for he almost exclusively in the genitive case (Διός) to further foster the notion that we come from Zeus or out from Zeus - Ἐκ Διὸς. Finally, ἀρχώμεσθα, our verb meaning “let us begin,” is in the middle voice, which in Classical Greek means that the force of the action upon the verb will somehow relate back to its subject, which is not Zeus but “we” - humans - as characterized by the first person plural ending -μεθα. Finally, the fact that this verb is in the subjunctive mood thereby expresses something that cannot be proven but only alluded to, believed in, and upheld. This something of course is Zeus’ all-creating nature. Through the establishment of Zeus as all-encompassing, all-doing, and the ultimate creator of the heavens, Aratus grounds his text in the argument that his audience can be both spiritual, through the veneration of Zeus, and function within the scientific realm as naked-eye astronomers by following along with his words as he tells of the skies above him how the stars, “all alike, many though they be and other star in other path, are drawn across the heavens always through all time continually” [translation by Mair (1955:19-21)]. Douglas Kidd, author of the Cambridge Classical Texts and Commentaries edition of Aratus’

Phaenomena, echoes this theme of the inclusiveness that Zeus exhibits as he writes that over the course of the *Phaenomena*, “the traditional sky-god Zeus is now presented as the life-giving force that pervades the whole cosmos, and [thus] we are a part of the cosmos and derive life from that force” (Kidd 1997:10). Through encompassing the universality of the natural world, he grounds his text within two frameworks that showcase two very distinct purposes. First, through the poetic genre of didactic epic, he methodically, meticulously, and at times mythologically delineates his subject matter with great care to assure his audience with confidence and certainty of his written observances of the skies. Second, Aratus employs a stylistic technique that showcases the esteem that Hellenistic writers held for their literary predecessors (Krevans and Sens 2006:189). Hellenistic authors drew upon a myriad of archaic and classical authors through the imitation of Homeric epic, the invocation of the Muses, and the incorporation of the Classical Greek mythological pantheon to not only more vividly describe their stories but to more easily connect with the assumed knowledge of the common learned person during the Hellenistic Age. Krevans and Sens continue: Hellenistic poets reconstructed archaic and classical genres in ways that suited their own interests. This focus on previous literature, however, was not uncritically nostalgic or antiquarian, but selective and self-conscious, calling attention to the unbridgeable gap between past and present [Krevans and Sens 2006:189-190; emphasis added].

The importance of this motif when analyzed in conjunction with the astronomical findings and overall significance of the *Phaenomena* simply cannot be overstated. As will be explained, it with this “unbridgeable” connection in mind that will ultimately lead to a better analysis of the text and a more clear understanding of the astronomical content of the *Phaenomena*. Through these two motifs, didacticism and literary homage to previous Greek writers, and the overarching recognition of Zeus’ power, Carl Sagan’s insight regarding “that sense of elation and humility combined” is more fully revealed, thus enabling Aratus to pray to the Muses, in the ultimate deference to his literary forerunners, to: “direct all my lay, even as is meet, to tell the stars” [translation by Mair (1955: 17-18)].

However, in order to properly apply an archaeoastronomical – as opposed to a purely astronomical – point of view to the *Phaenomena*, we must strive to rightly ground this work in the appropriate time frame and culture. Just as the language and style invoked by Aratus play an incredibly vital role in deciphering the astronomical content and overall meaning to this text, so does the analysis of the culture in which Aratus lived, the Hellenistic Age. Aratus was born at the outset of the Hellenistic Age in Cilicia in the town of Soli, comprising the region of the modern-day Turkish coast directly north of the island of Cyprus in 310 BCE. With the deaths of Alexander the Great and Aristotle just ten years prior, Aratus lived during a time period of great movement, change, and integration as this region adjusted to life post- Macedonian rule. “The Hellenistic world was international to a degree, polyglot . . . [an] age of renaissance and transition” (Sarton 1959:vii). With the expansion of Greek influence all the way to India as a result of the conquering of Alexander the Great, knowledge of the beginnings of Roman civilization to the east in Italy, and Alexandria’s cultural revival to the south in Egypt, it is fitting that Aratus could conceivably write a poem such as the *Phaenomena*, which so effectively blends the cultural facets of his day with astronomical accounts and celestial observations.

As Aratus composes 1,154 lines of poetry written in dactylic hexameter over the course of his *Phaenomena*, he weaves together out of the heavens and myth the ultimate ode to observational astronomy. Aratus' work consists of five main components and the following structure may be utilized to describe the text of the poem. The first 18 lines are Aratus' "proem" wherein he alludes to Zeus as a supreme deity over all humans and all life. During lines 19 – 461 he describes a rotating earth, the existence of poles, the "fixed stars" and groups them into 45 visible constellations. Thirty of these fall north of the ecliptic; the remaining 15 fall south. He finishes this passage with remarks about the confusing paths of the five known planets: Mercury, Venus, Mars, Jupiter, and Saturn. The next component, comprising lines 462 – 757, relates how the position of these constellations either in the nighttime skies, their respective locations on the horizon along with the rising and setting of the sun, or the location of these constellations on the Tropic of Cancer, Tropic of Capricorn, or the ecliptic give reference to the passage of time and allow for the reader's orientation in terms of time (e.g. for harvesting) and space (e.g. for sea navigation). Next, lines 758 – 1141 detail certain earthly and weather effects and animal patterns that foretell omens for his audience (Mair 1955: 198 – 205). Finally, it is during his last ten lines of poetry that Aratus reaffirms the reader to "study all the signs together throughout the year and never shall thy forecast of the [skies] be a random guess" [translation by Mair (1955:1153-1154)].

During his presentation of the skies, mainly occurring during the first three aforementioned sections of the *Phaenomena*, it is vital to the comprehension of the astronomical content contained within these passages that all of Aratus' writing is based on naked-eye astronomy, of trekking outside and looking up, of gazing upon the fixed stars in such a way as to make constellations and stories out of the heavens above. Over the first 461 lines, Aratus describes the classical constellations – from Andromeda to Virgo – and both the "phaenomena," or appearances, for each one in the nighttime sky as well as how these constellations may be viewed in relation to one another. In this sense, Aratus acts as a referent and a preserver of the skies. Subsequently, his work functions as that of a literary star map where on any given night it could be utilized to orient oneself in the celestial sphere. For example:
On either side of the Axis ends in two Poles, but thereof the one is not seen, whereas the other faces us in the north high above the ocean. Encompassing it two Bears wheel together – wherefore they are also called the Wains. . . . If, indeed, the tale be true, from Crete they by the will of mighty Zeus entered up into heaven, for that when in olden days he played as a child in fragrant Dicton, near the hill of Ida, they set him in a cave and nurtured him for the space of a year. . . . Now the one, men call by name Cynosura and the other Helice. It is by Helice that the Achaeans on the sea divine which way to steer their ships, but in the other the Phoenicians put their trust when they cross the sea. But Helice, appearing large at earliest night, is bright and easy to mark; but the other is small, yet better for sailors: for in a smaller orbit wheel all her stars. By her guidance, then, the men of Sidon steer the straightest course [translation by Mair (1955:25-44)].

This passage begins Aratus' representation of the nighttime sky and is exemplary of the true interdisciplinary work that must be achieved when considering a balanced analysis of the *Phaenomena*. Aratus begins his explication of the Bears by stating their relative positions in the sky: as two constellations placed around the pole "in the north high above the ocean" [translation by Mair (1955: 25-26)], meaning that these two constellations rotate high in the northern hemisphere in a tight rotation due to their proximity to the pole. However, since the two Bears are described in tandem, it is difficult at times to distinguish which of the Bear constellations refer to "Helice" and which to "Cynosura" based on the vagueness and at times confusing Classical Greek. When translating a primary document of Classical Greek text, any student or scholar of the Classics will gladly welcome a second opinion on a possible translation. Even G.W. Mair's English translation from the renowned Loeb Classical Library edition at times falls short to sort out "Aratean Appearances" and other significant astronomical observances and occurrences over the course of 1,154 lines of verse. At first it seems that with Aratus referring to the "other" as "small" after titling the larger of the two constellations Helice, it would be Cynosura, or the Lesser Bear (Ursa Minor), that would have a "smaller orbit wheel for all her stars" [translation by Mair (1955:42-43)]. However, by taking into account Theony Condos' remarks in her book, *Star Myths of the Greeks and Romans: A Sourcebook*, a reassuring sense of affirmation is obtained through her use of the available historical record as she notes that the sixth century BCE philosopher "Thales is reported to have urged the Greeks to follow the example of the Phoenicians in navigating by Ursa Minor

rather than Ursa Major. In all probability, the name Phoenice . . . originally referred to the "Phoenician" constellation, and was later absorbed into Greek account of Ursa Minor" (Condos 1997:262-263). Applying this reference from the available historical record helps to affirm Aratus' implied notion that Helice is the Greater Bear and Cynosura the Lesser. Finally, astronomical significance concludes this passage when Aratus writes, "but Helice, appearing large at earliest night, is bright and easy to mark" [translation by Mair (1955:41)]. The importance of this line reinforces the placement of Helice, the Greater Bear, as being placed among the other constellations high above the horizon. Also, the lack of grounding Helice within a particular Zodiacal constellation to depict its visibility, as Aratus often does with constellations that were only visible for part of the year further fosters the notion that Aratus knew that Helice, from a latitude of roughly 36 degrees North could be seen year round during his lifetime.

While his theme throughout the *Phaenomena* is to tell of the observed celestial phenomena, Aratus draws upon other Greek influences to describe the observed phenomena

of the heavens. The passage of the Wains above is a clear example showcasing the ways in which Hesiod had an impact on the writings and ideas of Aratus. An immediate parallel in that both Hesiod's *Works and Days* and Aratus' *Phaenomena* are both representative of the genre of a didactic, or instructive, epic. In this quote, the reader not only learns one application of the Wains, navigation, but also that the specific cultures, the Achaeans (Athenians) navigated by the Greater Bear and the Phoenicians, or men of Sidon, by the Lesser. Great information detailing how to distinguish one Bear from the other is also given: the Helice "[appears] large at earliest night" and is the bigger of the two, whereas the stars of Cynosura lie in a "smaller orbit wheel," and is the smaller of the two constellations

[translation by Mair (1955:41-44). Information may also be gathered just from the name Aratus employs to describe these constellations: "the Wains," or wagons. The name is didactic in itself in the way it represents how the constellations appear to rotate in a tight orbit fixed in the sky, such as a wagon would be wheeled around on Earth. Howard N. Porter comments also that "Hesiodic [in Aratus] are the deep religious feeling and mantic pose of the poet, the choice of subject matter, pastoral, not heroic, and the method of interweaving subject matter, myth, and proverb" (Porter 1946:158). Included in this weaving of "subject matter, myth, and proverb" are passages of the aetiological variety. For the most part, Aratus employs the use of myth to his greatest advantage to tell of the causes or reasons why particular image is the animal, type of human, or shape that is, or why that constellation is in the heavens at all. Lines 30-36 tell of the aetiology of the Wains, the reason why these constellations were configured from the fixed stars in the heavens for all time. Aratus alludes to the two nurses Zeus had while living on Crete, Helice and Cynosura, who took care of him while he was a young boy. Aratus writes that it was the all-powerful Zeus that preserved the gracious and kindly acts of these two nurses when he "placed [Helice and Cynosura] among the stars out of gratitude for their service" (Condos 1997:200). Finally, it is only when learning of the aetiological function of a constellation that the reader may begin to appreciate the parallels between a constellation's mythological origins and the usage for that constellation, if any, during the age of Aratus. Here, the parallel is clear: just as the nurses Helice and Cynosura aided Zeus through the steadfastness of their care when he was a young boy, so the serve to aide his own subjects when they are at sea as permanently fixed

constellations and guide points in the heavens for all time. Just as the utilization of Aratus' aetiological stories concerning particular constellations served as a reference point of shared common knowledge between Aratus and his audience, so did another important Aratean influence: Stoicism. After voyaging from Cilicia to write and study in Athens upon adulthood, Aratus studied under the founder of the Stoic school of thought, Zeno, who advocated a lifestyle such that "bodily and external advantages such as health and wealth are . . . natural objects of pursuit . . . [and] that by preferring them we are developing our skills at living in agreement with nature, the natural 'end' whose attainment amounts to perfect rationality, happiness, and a good life" (Sedley 2003:10). Stoic overtones are apparent throughout the *Phaenomena*, and just as Aratus' incorporation of aetiology and myth have improved the popular acclaim, so has the integration of a philosophy detailing a specific way to live that encompasses realizing one's place in the world.

In their 1955 article, Maurice Kelley and Samuel D. Atkins discuss the margin writings left behind by the great English poet, John Milton in four great Classical Greek works by Pindar, Aratus, Lycophron and Euripedes, texts he purchased between 1629 and 1634 (Kelley and Atkins 1955: 1090). Purchased in 1631, Milton's copy of the *Phaenomena* by Aratus was printed in Paris in 1559. On the title page of Milton's copy of the *Phaenomena*, he quotes this Ovidian tribute from his work, the *Amores*, "cum sole et luna semper Aratus erit" (Kelley and Atkins 1955: 1092). "With the sun and the moon, always Aratus shall be" [translation by author]. However, Ovid and Milton are not the only ones to recognize the significant contribution Aratus has made to the historical and astronomical record as William Sale makes clear in his article, "The Popularity of Aratus." Throughout "The Popularity of Aratus," Sale explores the numerous ways in which his work, the *Phaenomena*, held captive through its publication an audience that kept the poem "so enormously popular from the third century BCE until at least the fourth of our era" (Sale 1966: 160). To do this, however, Sale successfully grounds his speculations in the way of thought and culture during the Hellenistic period in Ancient Greece. By the time of the publication of the *Phaenomena* around 275 BCE, the Hellenistic period was flourishing as the civilizations of Ancient Greece continued immersion into Rome, Italy to the east, all the way to India in the far west, continued to look south to the prosperous city of Alexandria, Egypt, and to other known parts of the western world. With this expansion and perception on movement and integration, the themes of Stoicism likewise stressed "interrelation" among all aspects of one's life and the world around him/her (Sellars 2006:52). Incredible applications of this concept are inherent throughout Aratus' *Phaenomena*.

It is certainly apparent that the *Phaenomena* is a combination of observed astronomy with the naked eye, myth, religion, and scientific applications toward the study of the celestial sphere. Sale rightly underscores this by stating that Aratus “had a peculiar affinity for more sets of tastes, fore more cultures than one” (Sale 1966: 161). It is with this mode of thinking, of grounding the *Phaenomena* of Aratus in a cultural frame instead of an abstract, scientific frame that William Sale is able to breathe new archaeoastronomical significance into this text from the third century BCE.

By using this approach, Sale encourages the reader to read the *Phaenomena* not as just some cumbersome list of celestial observances but as a complete cultural ode to the phenomena – the Appearances – that were permanent fixtures of their lives and echoed cultural lifestyles of the Hellenistic period. One such lifestyle successfully mirrored in this text is the Stoic school of thought. Sale writes:

The information conveyed [in the *Phaenomena*] is perhaps useful, up to a point – but the effect of this overwhelming accumulation is that all nature is active, alive, and directing itself, among other things, to fulfill the great purpose of revealing to the mind of man just how the whole is about to behave [Sale 1966:161 – 162].

Here, Sale secures the theme of Aratus' *Phaenomena* with Stoic overtones about attempting to abide by the Natural Law. With this, Sale wholly emphasizes that it is only based on a solid working of the ways in which the heavens operate, with constellations to, as Aratus writes, “mark as the seasons pass, each returning at its appointed time: for all are unchangingly and firmly fixed in the heavens...” (translation by Mair (1955:451-455)). Both Sale and Aratus affirm that it is necessary to have some notion of a constant force so that man may then begin to find his particular place in the world.

This concept of a “constant force,” although physically present if to mean the constellations, the planets, and the sun and moon, can also be taken spiritually – and therefore metaphysically – to both Aratus and his audience as the incarnation of Zeus. The first eight lines of the *Phaenomena* are a shining testament to Zeus and to his all-encompassing nature. From Zeus “we are also his offspring” and “for himself it was who set the signs in heaven, and marked out the constellations...” [translation by Mair (1955: 5-10)]. Sale describes Aratus' initial lines of poetry as a “moving religious expression of the best-loved philosophy of the era” (Sale 1966: 161). To finish his point, Sale slyly intertwines Stoic reasoning by concluding that since Zeus is eternal and right, his rationale “must be a purposeful one, and if that Reason is all-pervasive, each part of the whole must have a purpose” (Sale 1966:161). Here, Sale shows that Aratus' story, at times a reverent, creation and myth story and at others a referent, didactic instruction manual for the heavens, can indeed be both.

Finally, Sale illustrates this point one final time as he clearly states that the *Phaenomena* stands as a contradiction: “the poetic vision is threatened by scholarship, which calls catasterism nonsense; by science which recognizes the constellations as conventional... mechanical, regular, and quantifiable” (Sale 1966:164). However, it is precisely this contradiction that qualifies Aratus' *Phaenomena* to be a worthy text, an undoubtedly necessary part of the historical record that must be researched when concerning the perceptions of astronomy and celestial observances inherent in the *Phaenomena* and greater Greek culture. It is this contradiction, in an age “which loved to use the mind but seemed to sense what could be lost when the mind was used and truth revealed” (Sale 1966:164) that is so unique to this time period of the Hellenistic age and thus to the nature and style of *Phaenomena*. It is only in understanding and cultivating this contradiction that the reader, caught somewhere between mythology and science, just like Aratus, will then be able to begin to secure knowledge of his world: the earth, the sky, the heavens, and all its inhabitants.

Just as Aratus drew upon his Stoic teachings from the work of Zeno, it is an assumed part of the historical record that Aratus also elicited the work of Eudoxus in preparation for his poetic composition, the *Phaenomena* (Evans 1998: 75). Eudoxus lived just prior to Aratus during the late fourth century BCE during the Classical Age in Greece and was responsible for furthering the scope of both naked-eye and theoretical astronomy during the Classical Age. Although none of Eudoxus' works are extant, “in the case of the *Phaenomena* . . . a

paraphrase [exists], for Eudoxus' description of the night sky inspired the poet Aratus of Soli to produce a versified version about a century later (Evans 1998: 75). The precise amount of observances Aratus elicited from Eudoxus will of course remain lost in the historical record, however Evans asserts that it is from Eudoxus that Aratus was able to allude to the scientific structure of the Earth and the heavens and in “introducing the theory of the celestial sphere, [wherein] the Greeks took a decisive step toward geometrizing their worldview” (Evans 1998:76). By drawing upon the ideas of Eudoxus, as well as the ideas of Hesiod and Stoicism, Aratus affirms that to accurately study the skies is to a great deal more than observe the fixed stars and constellations as they move across the heavens year after year: one must ground these observances within a specific culture appropriate not only to the observances but to time during which Aratus' composed the *Phaenomena*.

Noting this concept, in addition to Hesiod Stoicism, and Eudoxus, could Aratus have had a possible fourth influence during his undertaking and preparation of the *Phaenomena*? If we are to take Aratus at his previously mentioned word, that through our study of the phenomena of the sky and earth, the reader will learn to ground his/her predictions in

observances, the question concerning just how precisely he/she can obtain these predictions concerning the whereabouts of the constellations for a specific time during a specific year compels the astronomical mind to wonder. Ever since the publication of the *Phaenomena* by Aratus and its subsequent launch into the written record of Hellenistic culture, controversy and confusion regarding historical inaccuracies, astronomical impossibilities, and the existence of a primary source or authorship concerning these 1154 lines of dactylic hexameter have abounded. Numerous critics of today attempting to tackle the *Phaenomena* from a

purely astronomical and technical perspective will, just as their predecessors dating all the way back to Aratu's near-contemporary and fellow astronomer, Hipparchus, who lived just one generation later, inevitably fall short of any sort of fantasies of a poem with immaculate observations that can stand not only the test of time, but also the concept of precession, or the cyclic shift occurring every 26,000 years as a result of the rotation of the earth's axis of the celestial poles (Aveni 2001: 99). Along with precession, one must also consider that throughout the *Phaenomena*, Aratus preserves observations inherently subjective to the viewer through the basis of naked-eye astronomy. It is also important to note that while the majority of Aratus' statements in the *Phaenomena* concerning a particular constellation indeed are true when viewed in relation to another constellation, it is indeed much harder to ascertain the validity of his statements when viewed in relation to time. Greek culture spans at least from the late eighth century BCE, with Babylonian and other regional influences spanning past 2000 BCE through the means of oral and cultural transmission. Two contemporary researchers, A.E. Roy and S. V Zhitomirsky, explore this notion in their works, 1984's "The Origin of the Constellations," and 1997's "Aratus' *Phaenomena*: Dating and Analysing its Primary Source," respectively. Both Roy and Zhitomirsky offer novel insight into the derivation of this fourth potential Aratean influence, the creators of the mconstellations.

Roy begins his research into attempting to date the source of the Aratean constellations with the establishment of the observer's latitude. Roy is aware that to determine the date of a constellation, one must know his/her own latitude and the location of the constellation in

question. "When we examine the distribution of ancient constellations on the celestial sphere we find that not all of the stars are formed into ancient constellations" (Roy 1984: 174), spurring Roy to the conclusion that based on this area containing stars but no constellations, Roy declares that by measuring and analyzing this area, he can rightly deduce the location of the source or sources who created these star patterns across the nighttime sky. Roy correctly infers that just as "a northern observer in latitude [from 0 degrees North latitude to the latitude of the north celestial pole] cannot see a cap of the southern sky stars centered on the south celestial pole. . . . The angular radius of this zone of avoidance is the latitude of the observer" (Roy 1984: 174). Roy concludes that based on his measurements, this "zone of avoidance" measures roughly 36 degrees, resulting in the location of the creators at a latitude of 36 degrees North. "Very roughly speaking the center of the zone of avoidance corresponds with the south celestial pole at a time about 2500 BCE" (Roy 1984:175). Over the course of "The Origin of the Constellations," Roy examines four cultures in his attempts to match the celestial observations described in the *Phaenomena* with the location and identity of the creators. These four cultures are the Egyptians, the Phoenicians, the Babylonians, and the Minoans (Roy: 1984). Roy eliminates the Phoenician civilization for "living too recently to meet the requirement of the date [around 2500 BCE] . . . [and for being] non-starters" (Roy: 2984:183) and the Egyptians for existing too far to the south at 32 degrees North latitude (Roy: 1984:185) but rightly pauses on the Babylonian civilization as he writes: "throughout the millennia in which the Mesopotamian civilizations flourished, the constellation figures and

legends finally embodied in Aratus existed on all levels, religious and secular" (Roy 1984:186). Taking this sentiment strongly into account, Roy settles on the Minoan civilization of 36 degrees North latitude as adapters of the Babylonian system "for their own navigational use" (Roy 1984:187), which ties in nicely with Aratus' propensity for describing the function of so constellations in terms of navigational purposes at sea in the *Phaenomena*. However, it cannot be argued that Aratus wrote the poem, *Phaenomena*, around 275 BCE and with it permanently cemented astronomical perceptions regarding the celestial sphere and the heavens in his lifetime during the Hellenistic period.

Or can it? Continuing with Roy's contentions but differing slightly in hypothesis is S.V. Zhitomirsky. In "Aratus' *Phaenomena*: Dating and Analysing Its Primary Source," author Zhitomirsky utilizes a novel approach in his engagement with the text as he attempts to make the conjecture that even though the *Phaenomena* is in itself a primary document, it might have had some sort of primary source – initial creators – who serve as a collective impetus for the content, description, and style throughout the poem. Through the advancement of dating methods made by the astronomer Roy in his article, "The Origin of the Constellations" (1984), evaluating discrepancies between the original Aratean text and his own subsequent findings, and recognizing the importance of horizon and observational astronomy in the *Phaenomena*, Zhitomirsky comes to the conclusion that the primary sources responsible for the content of the *Phaenomena* could have come as early as the beginning as 2000 BCE, more than 1500 years before Aratus' wrote his poem in the third century BCE.

Despite the fact that Aratus does at his own discretion freely divulge into myth, religion, and other well-known cultural aspects of his day (such as navigation) throughout the *Phaenomena*, his poem is indeed abundant with clear, concrete statements that are to be taken as part of the factual record by the reader. Zhitomirsky begins his article with both a

summary of the *Phaenomena* and of Archie E. Roy's work in studying these more concrete statements throughout the poem. Here, Roy's intention was to study which time period best fit these celestial observances and whether it fit the time period of Aratus. Roy used 34 Aratean statements and manipulated them using a statistical approach and star maps "of selected dates from AD 2000 to 5000 BC" to discover that the majority of the celestial observances mentioned in *Phaenomena* fell around 2000 BCE (Zhitomirsky 1999: 484). However, it is Zhitomirsky himself that states that due to the fact that "Roy conducted his investigation visually and used his own evaluations... [it is] much more difficult to determine the degree of reliability of the results he obtained" (Zhitomirsky 1999:485). Based on this, the author embarks on an improved method of attempting to locate a potential primary source in Aratus' *Phaenomena*. By incorporating celestial observances from the text and plotting these constellations in "ecliptic coordinates with cylindrical projection" over the ecliptic (represented by a straight line) and the equator and tropics (represented by a sine curve), Zhitomirsky is then able to tell which celestial observances fit which corresponding time period (Zhitomirsky 1999: 485). In his own study, Zhitomirsky looked at 31 intersections between constellation and the equator or tropic line that allowed him to match the observance of a celestial occurrence with its correct time period. Not surprisingly, Zhitomirsky's findings, like those of Roy in the 1980s, also insist on the conjecture of some sort of collected primary knowledge basis for the *Phaenomena* to be somewhere around 2000 BC (Zhitomirsky 1999: 494).

In his article, "Aratus' *Phaenomena*": Dating and Analysing Its Primary Source," Zhitomirsky offers several logical conclusions to strengthen his assertion of the existence and influence on an earlier primary source of knowledge and influx over the text of the *Phaenomena*. Among his final ideas rest two important notions: the latitude for the observations Aratus writes with in the *Phaenomena* and the cultural significance of the concept of oral tradition and with it the reverence of religion. First, Zhitomirsky attests that the viewpoints of Aratus come from a latitude of 36° N, "considerably to the north of the places where at that time... the developed civilizations – the Sumerian and the ancient Egyptian – were located" for the given time period of 2000 BC (Zhitomirsky 1999: 497). For historical and comparative purposes, the Greek Dark Ages did not start until 1150 BCE, nor was the Classical Period even until 500 BCE.

Finally, Zhitomirsky comments on the cultural significance of oral tradition among the Greek culture. For Zhitomirsky, it is entirely plausible that it is Aratus who at last cements these celestial observances and ideas thousands of years in the making in the written form of the *Phaenomena*. The fact that since this document has remained relatively unchanged since its written publication more than two thousand years ago echoes the veneration that members of the Hellenistic culture held for the celestial occurrences of the heavens. In what is perhaps Zhitomirsky's most clear hypothesis for the existence of a primary source of the *Phaenomena* of Aratus, he writes that, "it might be presumed that the primary source of the poem was a verbal canonized description of the starry sky, and that its nature was that of a religious commandment" (Zhitomirsky 1999: 498). With this remark, Zhitomirsky makes the bold statement that for Aratus to amend this canonized representation of the sky would be to not only go against his esteemed ancestors, but also against all of nature and most importantly, the almighty, all encompassing Zeus. With his *Phaenomena*, Aratus preserves this canon.

However, this not to say that all of Aratus' statements regarding the celestial phenomena of the heavens are to be grounded in the epoch circa 2000 BCE. While Roy and Zhitomirsky both raise interesting points surrounding the contention that the majority of Aratus' observances precede any potential observances he could have made during his own

lifetime by nearly two millennia, in my own research regarding the validity of the astronomical statements within the *Phaenomena*, I have found instance that not only force further inquiry into the dating and source of the celestial observances but also ground these statements within the culture Aratus wrote through the representation of the Hellenistic tradition to both canonize the history of the ancients and of the Hellenistic culture highly characterized by the integration of cultures and ideas. The following two examples have been chosen for their simplicity in that the first statement refers to the comparison of two different constellations at a specific point in the year and the second refers to comparison of one constellation at two different points throughout the year. Through this simplicity, these examples also function to serve how the ways in which Aratus writes are truly representative of the Hellenistic Age, of trying to venerate the Ancients while attempting to move forward through change. The first example is as follows:

The three Belts rise and set all parallel but ever single and the same is the point where in due order each rises or sets at East and West. But the fourth circle passes over as much water of ocean as rolls between the rising of Aegoceros, and the rising of the Crab: as much as it occupies in rising, so much it occupies in setting" [translation by Mair (1955: 534-539).

In order to correctly analyze this passage to reveal any astronomical significance, it is important to determine first the literary meaning of the text. Throughout the *Phaenomena*,

Aratus refers to the equator, the Tropic of Cancer and the Tropic of Capricorn as "great circles" or "belts" (Mair 1955: 247), so it is logical that the "fourth circle" represents the ecliptic, or the observed path of the sun as it travels across the sky. It is also characteristic of Aratus to refer to the horizon and sky as "water of ocean." Zhitomirsky proposes this theme of alluding to the horizon as ocean "is in accordance not only with the ancient Greek myth, but also with the even more ancient Vedic one about the World Egg swimming in its waters" (Zhitomirsky 1997: 496-397). With this two facts regarding the text in place, our test becomes clear: in order to measure the validity of this statement in terms of time, the points where the sun rises during the winter and summer solstices must be deduced. In order to evaluate the text, however, one must incorporate the precession of the equinoxes. It is only by using a planisphere depicting precession or some type of computer program that will graphically show the effects of precession that a date showing the correlation between Aratus' description of the solstices and the time at which they actually occurred as he described them.

To analyze the validity of this statement, I utilized Milton D. Heifetz' precession wheel, "Precession of the Equinoxes: Historical Planisphere," a device that mimics the effect of precession as seen from the point-of-view of the observer. As the "era arrow" is aligned with different dates, different presentations of the constellations are showcased, a direct effect of precession of the equinoxes, which are cyclic and repeat roughly every 26,000 years. With the precession wheel aligned to the time at which Aratus was conceivably composing the *Phaenomena* around 275 BCE, the "era arrow" is aligned with 250 BCE, which represents the closest interval and only a span of 25 years, or very little time in the 26,000 year cycle of precession. The wheel is then manipulated to determine the location of the constellation

Cancer (the Crab), at the time of the summer solstice. Once properly aligned, the precession wheel shows that on the morning of the summer solstice, the sun did rise with the constellation Cancer. The validity of the first portion of this compound statement rests in the time of Aratus (Figure 1). To test the validity of the second portion of this statement, the same method or rotating the precession wheel until the sun rises on the morning of the winter solstice will lead to the subsequent location of the constellation Capricorn (Aegoceros).

However, during this era, as seen in Figure 2, Capricorn rises nowhere near the location of the sun during the sunrise of the winter solstice. With the wheel aligned at 250 BCE, the sun rises with no constellation; by sunrise on the summer solstice, the constellation of Sagittarius has already risen toward south of the sunrise, and with the constellation Capricorn having already made its heliacal set by the midwinter solstice, leaving it unseeable to the naked-eye astronomer. Aratus' statement regarding Capricorn isn't valid until the precession wheel is turned to show the skies as they were in 2000 BCE (Figure 3). In the era 2000 BCE, the midwinter sun rose amid the constellation Capricorn, and in turn correctly echoing the findings of Zhitomirsky (1997). Figure 4, included for purposes of literary, observational, and astronomical accuracy, shows the 2000 BCE rising of the summer solstice sun in the constellation Leo, not Cancer, and thus is congruent with the other observations.

By combining two separate sets of astronomical observations spanning more than 1,500 years within the same compound statement, Aratus' ability to represent his culture as both reverent to the history his ancestors and to the accurate astronomical observations of his present day is infallible. However, in doing so he – whether he was conscious of this or not – sacrifices the integrity of astronomical accuracy and precision of the entire compound statement when viewed objectively as a whole. Despite this, Aratus' allegiance to using the heavens to guide oneself through the year and the ages is reaffirmed.

Another example of an Aratean compound sentence representing this dichotomous and equally puzzling approach to the dating of his observation is as follows:

"Yea, and on the sea, too, many a sailor has marked the coming of the stormy tempest, remembering either dread Arcturus or other stars that draw from ocean in the morning twilight or at the first fall of night. For verily through them all the Sun passes in yearly course . . . as he rises and anon he sets, and ever another star looks upon another morn" [translation by Mair (1955: 744-751).

Just as in the previous example, an analysis of the meaning of the text must be derived before any astronomical significance may be inferred. Using Mair's footnote, he describes this passage as a omen foretelling of storms on the seas during Arcturus' heliacal rise in on the autumnal equinox in September and his cosmical set on the vernal equinox in March (Mair 1955: 264; emphasis added). In his approach to translating this portion of the text to the *Phaenomena*, G. R. Mair makes a distinction between heliacal rise/set and a cosmical rise/set. He translates the heliacal rising as "the first visible appearance of a star on the Eastern horizon before sunrise" (Mair 1955: 203). In opposition, he translates the cosmical setting as when the "star sets as the sun rises, [when] the star again [is] invisible because before it actually reaches the Western horizon it is obscured by the light of the rising sun" (Mair 1955: 203). To determine this passage's astronomical validity, first the precession wheel is aligned to Aratus' era at 250 BCE and then aligned to show the the sunrise of the autumnal equinox and the location of the star Arcturus of the constellation Bootes. Using the declination lines present on the precession wheel, it is determined that at sunrise, Arcturus rests about 13 degrees above the eastern horizon, successfully satisfying its test for astronomical validity. However, to test the second portion of this compound sentence, of attempting to locate the date of Arcturus' cosmical setting, that is to locate the era wherein Arcturus will set below the horizon at virtually the same time as the sun rises on the vernal equinox so as to be considered invisible and engulfed by the sun's rays, one would have to set the precession wheel all the way to the era 3,250 BCE (Heifetz 1997)! This exorbitant leap of time between the accuracy of his two

statements sacrifices once again any complete astronomical precision on the part of Aratus. However, it must be noted that this passage might signify Aratus', as well as other Greek astronomers, in their attempts to preserve the awe-inspiring time when the setting of Arcturus would be rendered invisible by the rising of the sun on the vernal equinox, one single day equal in length to its night.

Nevertheless, it cannot be overestimated the work that still must be done with this crucial document of the archaeoastronomical record for Hellenistic Greece. It cannot be disputed that the *Phaenomena* is inherently a text of astronomical significance; however, it remains for further research regarding the *Phaenomena* just how precise its astronomical alignments are regarding the placement of the constellations on the horizon and in the skies. While much progress has indeed shaped the perception of this text, from a poem full of inaccurate observations to a document rich in astronomical findings and astronomical remarks regarding how the heavens were perceived, it is only when his celestial descriptions are better integrated within the cultural attributes held by Aratus and representative of the Hellenistic Age that the full meaning of the *Phaenomena* will be revealed. The work of Roy and Zhitomirsky withstanding, Aratus' harshest critic was his virtual contemporary, Hipparchus of the second century BCE. Douglas Kidd, another translator of the *Phaenomena* defends Aratus when he remarks that so much confusion arises because Hipparchus made statements that will inherently cause him to differ with

Aratus, and thereby tainting the potential accuracy of his observations. Kidd writes that "many of errors that Hipparchus finds in Aratus [are found] because Aratus is referring to the visible constellations. Hipparchus is writing for readers who are interested in mathematical astronomy" (Kidd 1997: 20). This contemporary viewpoint becomes stronger when one incorporates the sentiments of Plato who, "with remarkable insight suggested that the observed movements of the planets [and by extension the movements of the fixed stars] are more apparent than real" (Kidd 1997: 161) It is only when studies of this text are grounded in the Hellenistic culture and performed by those recognizing the simplicity and beauty to the *Phaenomena* as Aratus preserves the Greek skies. Over the course of this text, Aratus writes as both the preserver of generation after generation of night skies of both his ancestors and of Zeus. He represents the culmination of these observations and his work successfully functions as a point of reference for looking at the heavens. To engage in the study of the *Phaenomena* is to embark upon the search to learn of Aratus the Reverent – the keeper of myths and devotee of Zeus – and Aratus the Referent – the curator of the constellations and the preserver of the heavens.

FIGURES

1. The rising of the constellation Cancer with the sun on the morning of the summer solstice, 275 BCE. (Heifetz, Milton D. 1997 *Precession of the Equinoxes: Historical Planisphere*)
2. The rising of the constellation Capricorn with the sun on the morning of the winter solstice, 275 BCE. (Heifetz, Milton D. 1997 *Precession of the Equinoxes: Historical Planisphere*)
3. The rising of the constellation Capricorn with the sun on the morning of the winter solstice, 2000 BCE. (Heifetz, Milton D. 1997 *Precession of the Equinoxes: Historical Planisphere*)
4. The rising of the constellation Cancer with the sun on the morning of the summer solstice, 2000 BCE. (Heifetz, Milton D. 1997 *Precession of the Equinoxes: Historical Planisphere*)

Figure 1. The rising of the constellation Cancer with the sun on the morning of the summer solstice, 275 BCE. (Heifetz, Milton D. 1997 Precession of the Equinoxes: Historial Planisphere)

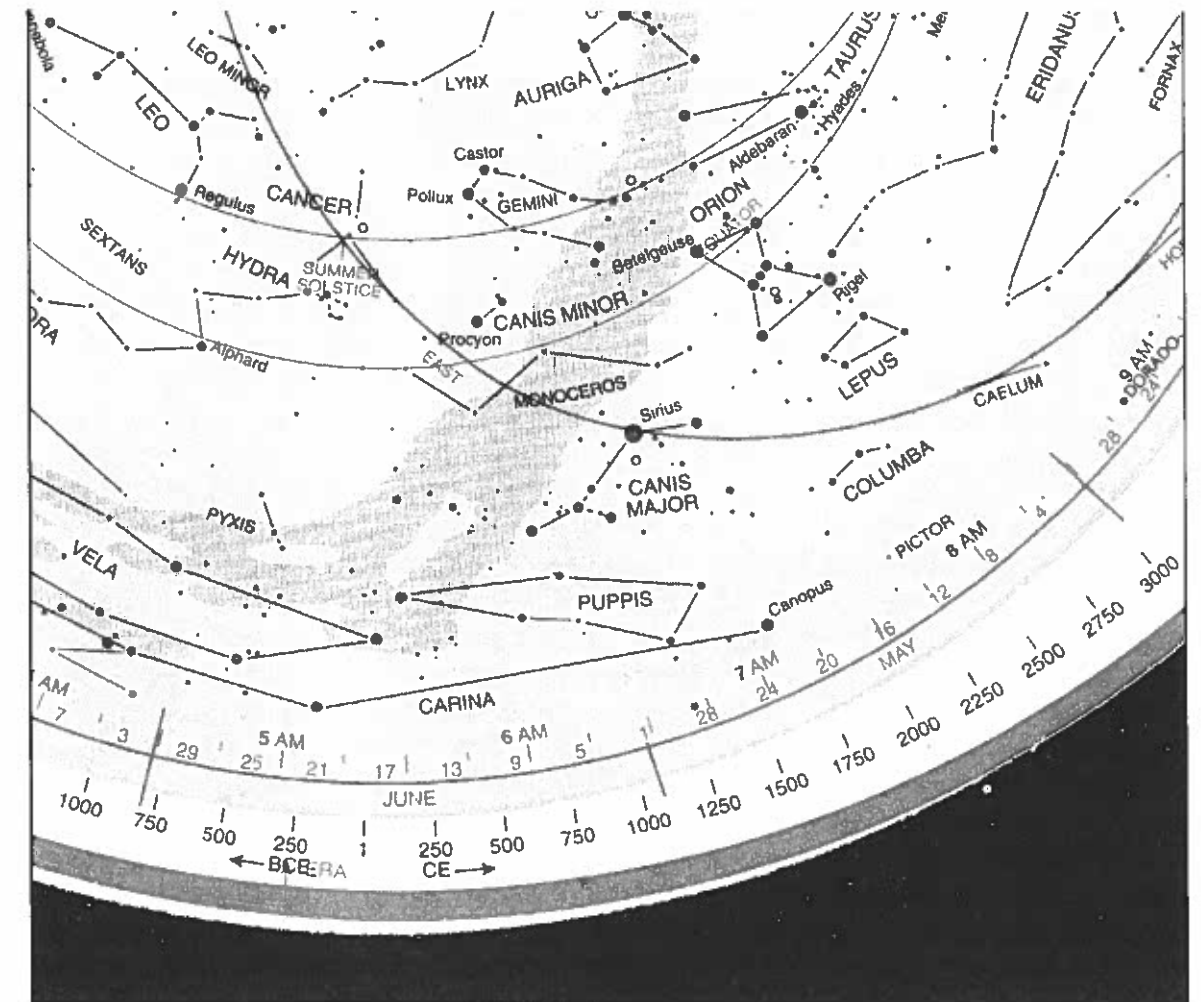
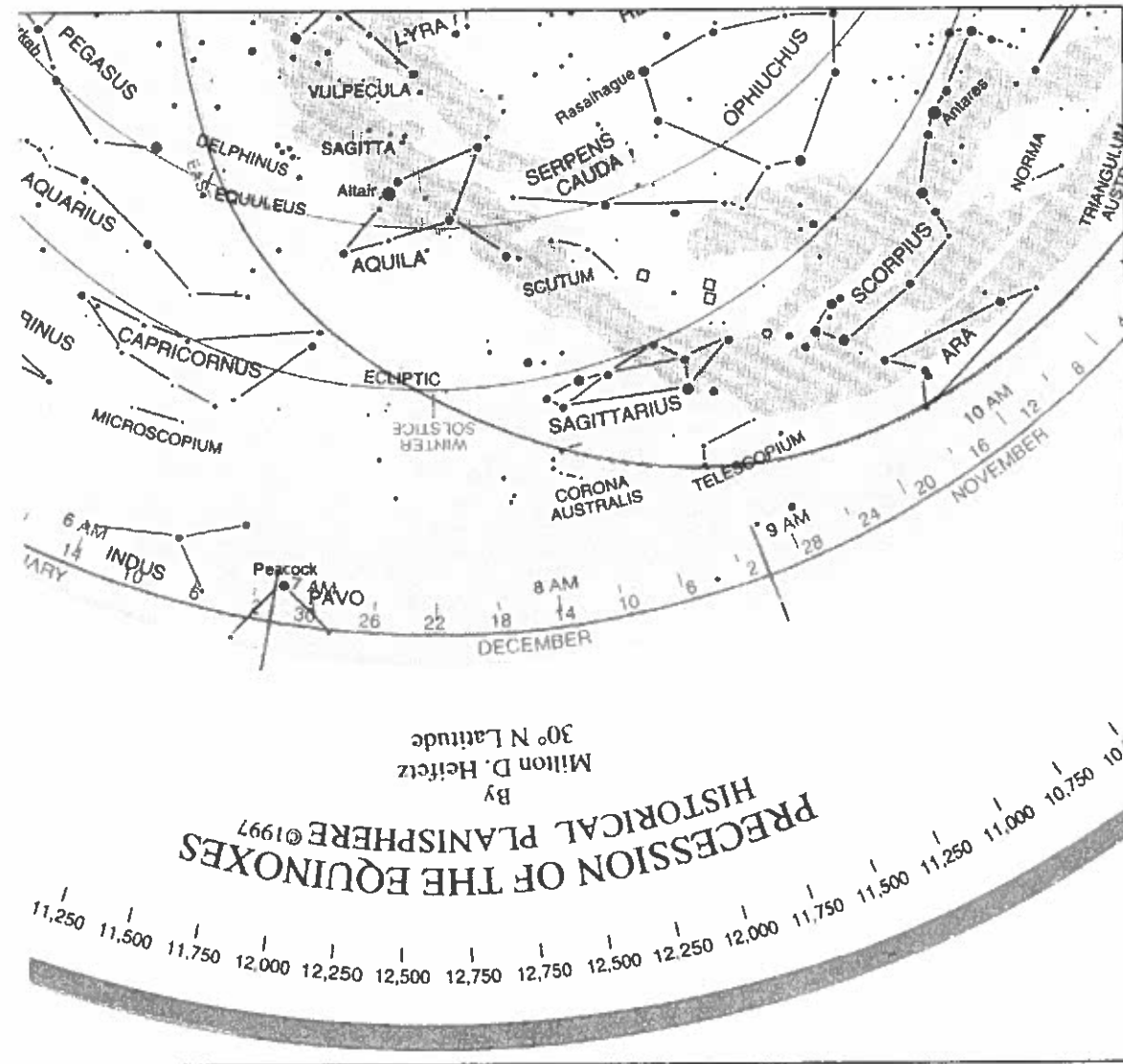
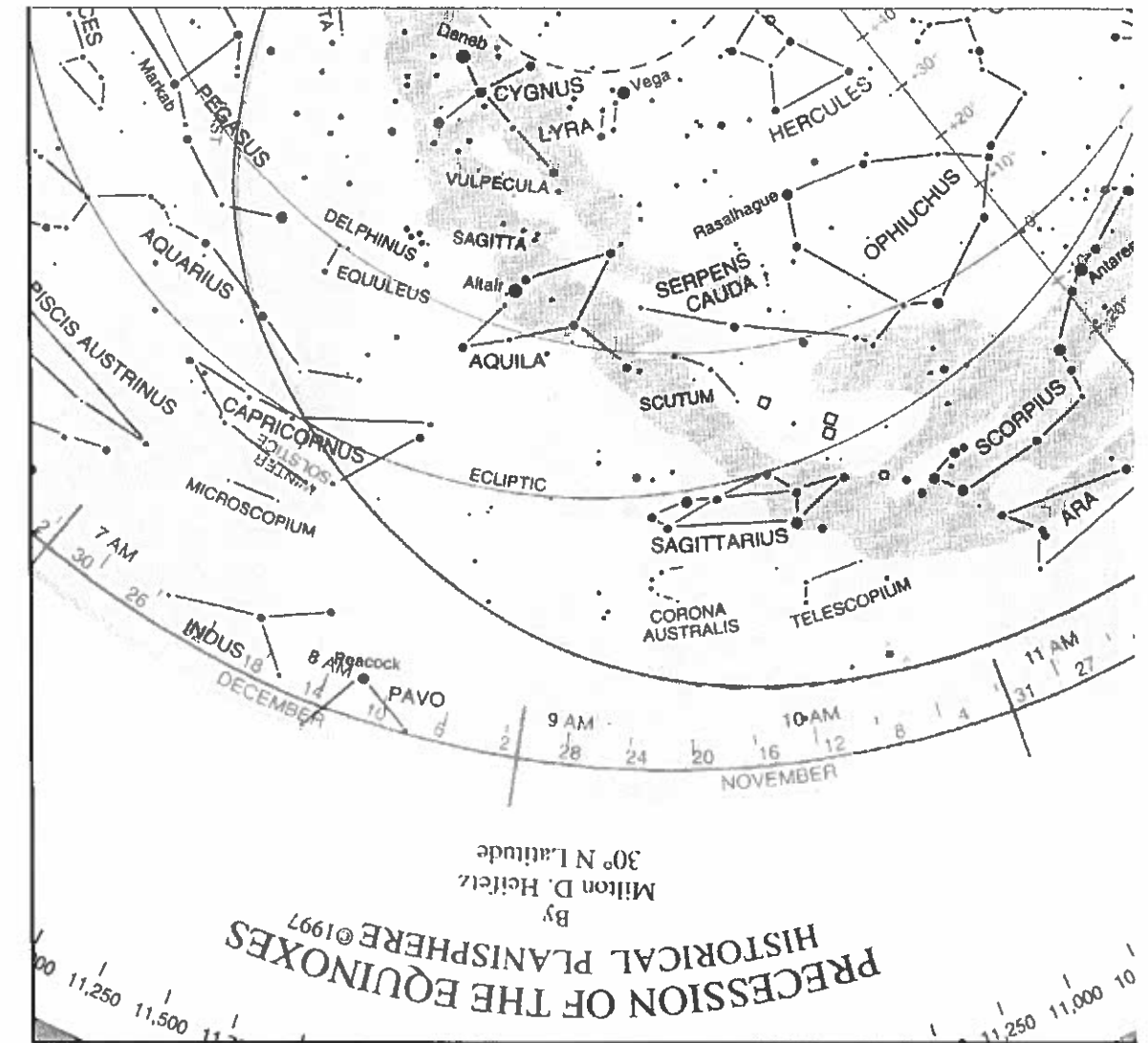


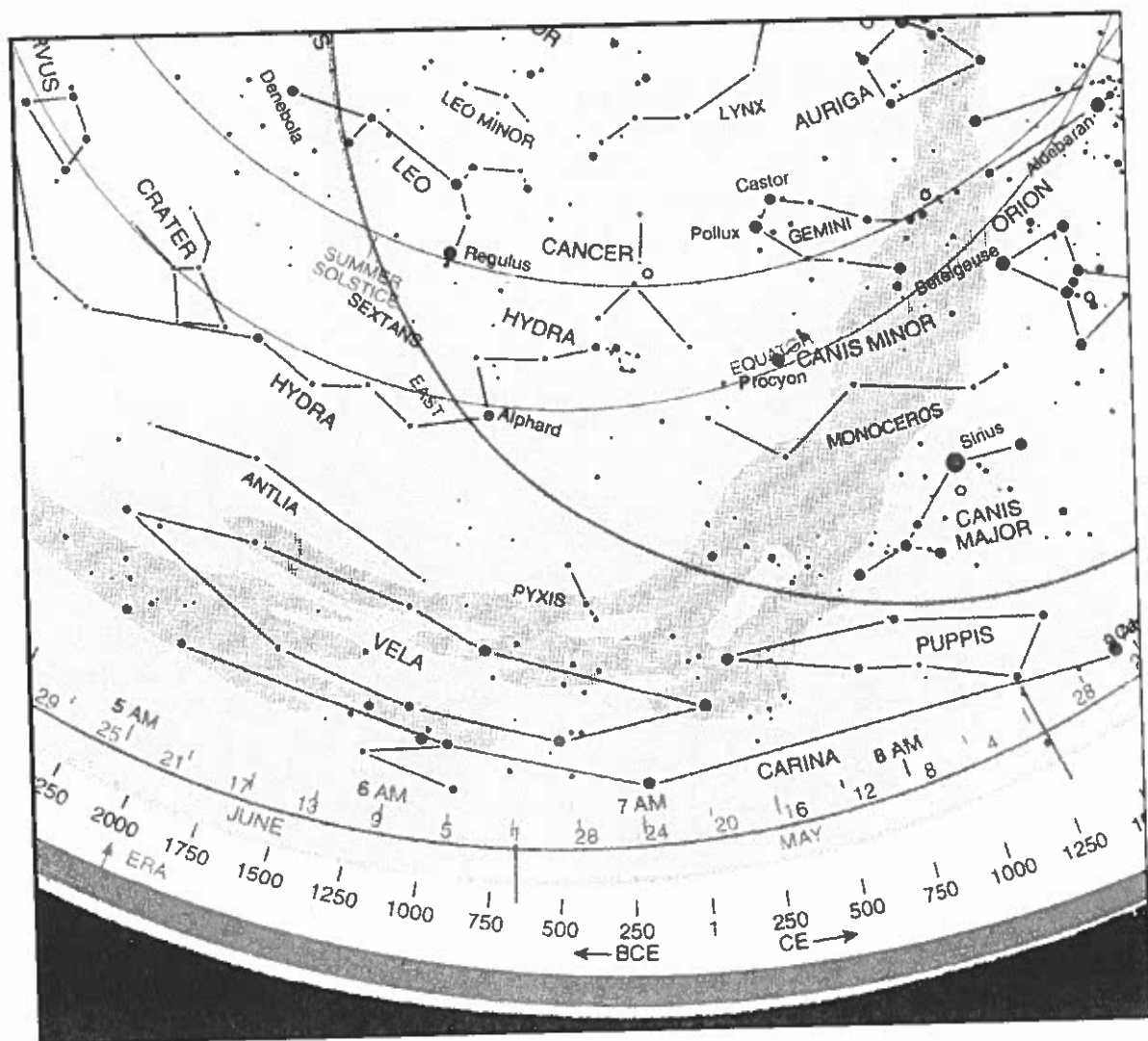
Figure 2. The rising of the constellation Capricorn with the sun on the morning of the winter solstice, 275 BCE. (Heifetz, Milton D. 1997 Precession of the Equinoxes: Historial Planisphere)



3. The rising of the constellation Capricorn with the sun on the morning of the winter solstice, 2000 BCE. (Heifetz, Milton D. 1997 Precession of the Equinoxes: Historical Planisphere)



4. The rising of the constellation Cancer with the sun on the morning of the summer solstice, 2000 BCE. (Heifetz, Milton D. 1997 Precession of the Equinoxes: Historical Planisphere)



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