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# Signs in the Song: Scientific Poetry in the Hellenistic Period

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# Signs in the Song: Scientific Poetry in the Hellenistic Period

## **Abstract**

My dissertation examines the works of three poets, Aratus, Apollonius of Rhodes, and Nicander, as scientific poetry. Rather than focusing on either literary or scientific material within them, I show that such a distinction is artificial and both literary and scientific interests are reflected in all aspects of these works. I argue that we should view the poems as serious attempts to discuss scientific matters, and that their intent to do so also impacts their own understanding of their poetry. In the introduction, I establish the parameters of my project, explain my definition of science, and discuss the lines of argumentation ancient scholars used to address the question of a poet's authority to speak about scientific subjects. In my first chapter, I address Aratus's *Phaenomena* as a poem about signs. Aratus ties his astronomical and meteorological information together through the unifying theme of semiology, and he focuses on the human ability to recognize signs and use them for practical purposes. My second chapter addresses Apollonius of Rhodes's position within contemporary geographical debates, in particular about the use of Homer as a source. Apollonius uses his poetry to argue not only that Homer's geography is authoritative but also that epic poetry has a prominent place in the discipline. In my final chapter, I focus on how Nicander establishes his relationship with Aratus as a way of legitimizing his subject of study, toxicology, and as a place of departure to secure his own position in the poetic canon. Nicander evinces a particular interest in taxonomy, and experiments with several different ways of organizing his information, while also exploring human mortality and the dangers of interactions with nature. All of this is united in his interest in names, as a means of differentiating species of venomous snakes and as a means of counteracting mortality by ensuring one's legacy. Each of these poets has a different goal in their works, but none of these can be cleanly separated into the literary and the scientific.

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Kathryn Dorothy Wilson

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in

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Degree of Doctor of Philosophy

2015

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SIGNS IN THE SONG: SCIENTIFIC POETRY IN THE HELLENISTIC PERIOD

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## ABSTRACT

### SIGNS IN THE SONG: SCIENTIFIC POETRY IN THE HELLENISTIC PERIOD

Kathryn Dorothy Wilson

Ralph M. Rosen

My dissertation examines the works of three poets, Aratus, Apollonius of Rhodes, and Nicander, as scientific poetry. Rather than focusing on either literary or scientific material within them, I show that such a distinction is artificial and both literary and scientific interests are reflected in all aspects of these works. I argue that we should view the poems as serious attempts to discuss scientific matters, and that their intent to do so also impacts their own understanding of their poetry. In the introduction, I establish the parameters of my project, explain my definition of science, and discuss the lines of argumentation ancient scholars used to address the question of a poet's authority to speak about scientific subjects. In my first chapter, I address Aratus' *Phaenomena* as a poem about signs. Aratus ties his astronomical and meteorological information together through the unifying theme of semiology, and he focuses on the human ability to recognize signs and use them for practical purposes. My second chapter addresses Apollonius of Rhodes' position within contemporary geographical debates, in particular about the use of Homer as a source. Apollonius uses his poetry to argue not only that Homer's geography is authoritative but also that epic poetry has a prominent place in the discipline. In my final chapter, I focus on how Nicander establishes his relationship with Aratus as a way of legitimizing his subject of study, toxicology, and as a place of departure to secure his own position in the poetic canon. Nicander evinces a particular

interest in taxonomy, and experiments with several different ways of organizing his information, while also exploring human mortality and the dangers of interactions with nature. All of this is united in his interest in names, as a means of differentiating species of venomous snakes and as a means of counteracting mortality by ensuring one's legacy. Each of these poets has a different goal in their works, but none of these can be cleanly separated into the literary and the scientific.



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# INTRODUCTION: WHAT DOES IT MEAN TO WRITE SCIENTIFIC POETRY?

## I. Scientific Poetry and Poetic Science

When I heard the learn'd astronomer;  
When the proofs, the figures, were ranged in columns before me;  
When I was shown the charts and the diagrams, to add, divide,  
and measure them;  
When I, sitting, heard the astronomer, where he lectured  
with much applause in the lecture-room,  
How soon, unaccountable, I became tired and sick;  
Till rising and gliding out, I wander'd off by myself,  
In the mystical moist night-air, and from time to time,  
Look'd up in perfect silence at the stars.

In 'When I Heard the Learn'd Astronomer,' Walt Whitman articulates a dichotomy between two ways of experiencing the universe. The first, that of the eponymous astronomer, is what we would call 'scientific': it is grounded in mathematical calculations, organized, and rational. By contrast, the narrator's approach is punningly 'unaccountable,' experiential, wandering, and even 'mystical.' Even the contexts are different: the stationary astronomer speaks indoors in a public setting, whereas the narrator moves outside, silently and by himself. The difference between these two ways of understanding the universe is so drastic that it provokes a physical reaction in the narrator. The poem reflects a tension between scientific and poetic modes of

understanding prevalent in the nineteenth and early twentieth centuries.<sup>1</sup> Science and poetry become fundamentally incompatible ways of viewing the universe.

Reading this poem, one wonders what Whitman might have thought about Aratus' *Phaenomena*, a poem that combines the technical, scientific methods of the "learn'd astronomer" with the narrator's wonderment at the beauty of the stars. Perhaps he would have embraced Aratus as a poet, but classical scholars have long assumed the same divide that Whitman articulates exists in the *Phaenomena* and felt it reflected poorly on Aratus as both poet and astronomer. That he wrote in poetry denied his work any scientific validity, and that he wrote about such technical and dry material rendered his verses unpleasant.<sup>2</sup> To many early scholars, Aratus was proof that poetry and science should be kept separate for the preservation of both.

The understanding of poetry and science at any given time, of course, depends on how they are defined and what role they are given in that society. Neither poetry nor science held exactly the same role in antiquity as they do today, and these roles have grown increasingly distant as the correct way of "doing science" has become increasingly canonized within academic institutions since the Enlightenment.<sup>3</sup> Recently, however,

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<sup>1</sup> Goran (1940) includes this poem as evidence of a large-scale rejection of science by the "literati" in the 19<sup>th</sup> century. Sistikou (2012), pp. 193-95, discusses the role of science for Romanticism, which is rather contested, see p. 194, n.2, and connects it to Hellenistic poetry and specifically Nicander.

<sup>2</sup> Kroll (1925), pp. 1847-50, for perhaps the strongest modern criticism of Aratus' poetic skill.

<sup>3</sup> Collini (2008), an introduction to a new edition of C.P. Snow's *The Two Cultures*, offers a detailed overview of the way developments in the academic system in the mid-nineteenth century helped to reify the divide between literary and scientific studies, but Snow (2008), pp.1-51, in his original Rede lecture at Cambridge (in 1959) that later became the book, saw the crucial turning point as the 'Scientific Revolution' in the seventeenth and eighteenth centuries. Snow (2008), pp.60-61, articulates a complete divide in the modern (1950's) world between the study of science and the study of literature: "In our society (that is, advanced western society) we have lost even the pretence of a common culture...I gave the most pointed example of this lack of communication in the shape of two groups of people, representing what I have

scholars have begun to query whether this is a cultural or an ontological divide, and to consider the similarities of intellectual inquiry across disciplines.<sup>4</sup> The division that Whitman sees, and that early scholars used to interpret Aratus, no longer seems to be an intrinsic part of the definition of poetry and science, but rather a historical development. The *Phaenomena* is a product of a time when, as I shall argue in this dissertation, sharp divisions between the artistic and the scientific did not exist. To the critics who have seen no beauty in Aratus' verses, I can offer no rebuttal; that is a matter of taste. But the suggestion that his work is not *scientific*, simply because he composed in verse, can be refuted.<sup>5</sup> In this study, then, I will explore the ways in which the poetry of Aratus, Apollonius of Rhodes, and Nicander of Colophon can be seen as scientific—in the context of his time, that is—without sacrificing any claim to be poetry as well. Great experimentation took place in the Hellenistic period in both poetic composition and scientific inquiry.<sup>6</sup> It is only natural that some of that experimentation would collide, and the works of three authors, Aratus, Apollonius, and Nicander are part of both movements.

Interpretations of these works have been limited by our assumptions about the roles of both poetry and science. This is reflected in the preface to the edited volume,

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christened 'the two cultures'. One of these contained the scientists, whose weight, achievement and influence did not need stressing. The other contained the literary intellectuals. I did not mean that literary intellectuals act as the main decision-makers of the western world. I meant that literary intellectuals represent, vocalise, and to some extent shape and predict the mood of the nonscientific culture: they do not make the decisions, but their words seep into the minds of those who do. Between these two groups—the scientists and the literary intellectuals—there is little communication and, instead of fellow-feeling, something like hostility.” See Shapin (1996) on continuity and discontinuity in the so-called ‘Scientific Revolution’ in the Enlightenment. Graham (2013), pp. 7-40, offers a useful overview of the different types of long-term narratives about the history of science that are common in the scholarship. He addresses the role of the Greeks in problematizing the idea of a scientific revolution on pp. 39-40.

<sup>4</sup> See Lloyd (2009), pp. 178-81, and, with a modern focus, Daston and Galison (2007).

<sup>5</sup> See Kidd (1997), p. 16, for a fairly moderate argument about in support of Aratus' skill as an astronomer, and Martin (1998), vol.1, pp. lxxxvi-xcvii, for a more extreme version of the argument.

<sup>6</sup> See Asper (2009), p.1. See pp. 52-53 on the issues of defining the Hellenistic Period.

*Nature and Science in Hellenistic Poetry*, where Annette Harder discusses the relationship between science and poetry:

At first sight the treatment of scientific subjects by poets may seem to obscure the boundaries between literature and science, but when one looks closer the differences are still visible and sometimes seem to be exploited for a specific purpose.

On the one hand there is poetry in which authors like Aratus and Nicander are using scientific material and make it the main subject of their work, embedding modern material into the old tradition of archaic didactic poetry... Even so, there is an important difference between these poets and scientists. In authors like Aratus an ideological purpose can be detected, which transcends the mere collection and organization of the scientific material, and in other poets too literary concerns are clearly of more importance than scientific ones. Thus Nicander's work contains obscure vocabulary and details that are not really useful, but no practical information like the right quantities of the ingredients for the antidotes. Also the impression of danger and horror which is found throughout the poem may be regarded as inspired by literary consideration.<sup>7</sup>

This quote is an excellent representation of the prevailing assumptions in treating the interaction of science and poetry. In what follows, I shall attempt to dissect some of the common claims we make about these works and the relationship of poetry and science within them.

First, there is the metaphor implicit in the verb 'embedding.' This suggests that the science is somehow external and separate from the poetry, and, unchangeable on its own, is merely being placed into the fabric of a poem. Harder's metaphor probably refers to the prose sources that these poets used, a subject that will be discussed at greater length in Section IV of this introduction, but it is far from unproblematic. The metaphor implies a subject alien to the form in which it is presented. In contrast, one would never

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<sup>7</sup> Harder (2009), p. vi.

claim that Callimachus is ‘embedding’ mythology into his poems. We should be careful about suggesting that any subject would be inappropriate for poets, given the extremely poor preservation of most poetry, especially from the fourth century and the Hellenistic period. In fact, the evidence suggests that there once was a large number of poetic works on a wide variety of scientific subjects, and their existence shows that science was not universally regarded as an element foreign to poetry.<sup>8</sup>

Second, the passage implies a strong correlation between modernity and science that is also incorrect for the time period. Eudoxus’ works were approximately a century old when Aratus used them to compose the *Phaenomena*.<sup>9</sup> Older authorities were valued more highly and considered more trustworthy, and innovation was a double-edged sword—necessary for attracting an audience, but also risky.<sup>10</sup> The authority of archaic poetry, especially of Homer and Hesiod, factors heavily into the way Hellenistic poets convey their ideas. All three of the poets have an important relationship with both Homer and Hesiod, and it is an essential feature of their scientific program. But we should be careful about drawing too simple an analogy between poetry and antiquity, on the one hand, and science and modernity on the other.

Harder’s specific disqualification of Aratus and Nicander as scientists is based on assumptions about the practices of ancient science that are also problematic.

Specifically, she states that Aratus’ larger ideological intention — by which she appears to mean, his supposed allegiance to Stoicism — disqualifies the *Phaenomena* as science.

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<sup>8</sup> See Gutzwiller (2007), pp. 175-78.

<sup>9</sup> See Kidd (1997), pp. 14-18, on Aratus’ use of Eudoxus and chronology.

<sup>10</sup> Lloyd (1987), pp. 50-108, addresses this.

But this would surely also disqualify Aristotle, Theophrastus, Posidonius, and any other writer strongly affiliated with a philosophical school.<sup>11</sup> In any case, interpretations of Aratus as a Stoic poet have been exaggerated. He does, however, have a strong belief in the omnipresence of signs in the universe, and this belief informs his understanding of the material he presents.<sup>12</sup> In fact, it demonstrates a larger theoretical framework, which he uses empirical evidence to support.

In contrast, the dismissal of Nicander repeats the standard reading of his poetry as nothing more than a series of formalist exercises. I will discuss this argument more thoroughly in Chapter 3, as it is a long-standing opinion that should be reassessed. But Harder's criticisms also include the lack of "useful" and "practical" information in the poems. Must a work include useful information to be scientific? The works of Archimedes contain little explicitly practical information, but are uncontroversially considered scientific.<sup>13</sup> The debate over the usefulness of Nicander's works to an actual victim of poisoning can obscure the question of whether he has any serious ideas about the subject of toxicology. Theophrastus' botanical work is of minimum practical benefit, so why must Nicander's poetry be efficacious to be considered science?

Harder's dismissal of Aratus and Nicander reflects a number of currently widespread beliefs about the relationship between poetry and science, which I hope to challenge in this dissertation. The assumption of a fundamental incompatibility between poetry and science has defined previous scholarship on these works. Most importantly, it

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<sup>11</sup> On the relationship between philosophy and science, see Kahn (1991); Lloyd (1979), pp. 32-37.

<sup>12</sup> Aratus' relationship to Stoicism will be discussed in greater detail in Chapter 1, see pp. 93-97.

<sup>13</sup> See Russo (2004); Netz (2009).



has led to an artificial division in the scholarship between the literary and the scientific, as though the two should be studied separately and have no bearing on each other.

Overduin, for example, outlines what subjects are and are not included in his “Literary Commentary:”

[I]t has not been my goal to provide the reader with elucidations in matters of herpetology, botany, biology, entomology, pharmacology or medicine... attention will be paid to the different dimensions of the adjective ‘literary’ with regard to the *Theriaca* of Nicander of Colophon, including matters of narratology, mythology, aetiology, diction, genre, tradition, poet-self awareness, and aesthetics.<sup>14</sup>

Similarly, Hunter opens an article on Aratus with the admission:

What I shall not attempt here — but what is clearly a major *desideratum* — is what might be termed a ‘modern Hipparchanism’, that is, a detailed examination of how Aratus’ account of the heavens exploits and/or misunderstands contemporary ‘science’.<sup>15</sup>

These quotations reflect an assumption that, in both these cases, the author’s “technical” or “scientific” subject matter can be safely ignored when discussing his poem *qua* poem.

This creates a division between the scientific content of the poem and a more loosely defined focus on the poetic form. “Form” can include content, however, if that content is deemed sufficiently literary, as has been the case with mythological digressions.<sup>16</sup>

This division is deeply problematic, and in this dissertation, I have attempted to understand both aspects, content as well as form, as equally important facets of these works, or rather, to understand these works as integrated wholes, in which the union of science and poetry is an important feature.

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<sup>14</sup> Overduin (2014a), p.1.

<sup>15</sup> Hunter (1995a), p. 154.

<sup>16</sup> For example, the extensive treatment of the Myth of Ages in Aratus’ telling of the catasterism of Dike: Norden (1893); Wilamowitz (1924), II. p. 65; Schütze (1935); Porter (1946); Ludwig (1963); Solmsen (1966); Scheisaro (1996); Fakas (2001), pp. 151-60; Fantazzi and Hunter (2004), pp. 238-42; Gee (2013), pp. 22-35.

There has not been much scholarship on Hellenistic scientific poetry. Two edited volumes offer evidence that the popularity of the subject in this time period is uncontroversial: *Musa Docta: Recherches sur la poésie scientifique dans l'Antiquité* and *Nature and Science in Hellenistic Poetry*, in the Gröningen Hellenistic Poetry series, the preface of which is quoted above.<sup>17</sup> By their very nature as edited volumes, neither of these works is systematic. *Musa Docta*, moreover, has a longer chronological range, which makes it even more diffuse, although an entire third of the volume is dedicated to “Études nicandréennes.”<sup>18</sup> One monograph has broached the subject of the relationship between science and poetry in this time period, Reviel Netz’ *Ludic Proof*, which argues for the influence of Hellenistic aesthetics, as understood from poetry, on the works of Archimedes and Euclid.<sup>19</sup> Netz’ work is important for two reasons: first, it establishes the interconnectedness of the poetic and scientific communities in the Hellenistic Period, and second, it brings greater awareness to the idea that scientific writing, even mathematical writing, has *style*, a term typically reserved for works deemed more ‘literary’ than a mathematical proof. Netz argues not only that there is an aesthetics to scientific writing, but that this style is particular to the individual author, and shapes scientific writers’ understanding of the material they present.<sup>20</sup> This is an important point, because too frequently the ideal for scientific writing is seen as pure content, devoid of any conscious shaping by the writer. This is, of course, an impossible feat, but

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<sup>17</sup> Cusset (2006a), Harder, Regtuit, and Wakker (2009). Horster and Reitz (2005) is sometimes referenced as another volume of collected papers on the subject of science and poetry, but the range of discussion is broader.

<sup>18</sup> The articles in this section are Jacques (2006); Cusset (2006b); Magnelli (2006b); and Barbara (2006). Of the other papers in the volume, only Semanoff (2006) also discusses the Hellenistic period.

<sup>19</sup> Netz (2009).

<sup>20</sup> As explained in Netz (2009), pp.1-16.

Netz' scholarship shows that we should not assume that it is even the desired goal of every scientific writer. The more overt artistry and interest in aesthetics in these poets does not preclude their work from being scientific. Netz also includes a chapter that addresses Hellenistic poetry more directly, where he argues that methods of writing science and poetry are "complementary" and "parallel."<sup>21</sup>

Netz does include Apollonius in the same discussion as Aratus, however, which is unusual, because Apollonius has usually been excluded from the conversations that take place about Aratus and Nicander.<sup>22</sup> I believe that this is because of two issues. The first is the elision that is made in the scholarship of the distinction between didactic poetry and scientific poetry. In perhaps the most extreme instance of this, David Sider argues that Posidippus' epigrams on weather signs are "didactic epigram," because they address a scientific subject, despite having no explicit or implicit educational intent. What makes them didactic, to Sider, is their scientific content. As time and the genre progresses, didactic poetry comes increasingly to take scientific material as its subject matter, and Aratus and Nicander play an important role in this process.<sup>23</sup> But in the Hellenistic Period, the tradition linking science and the didactic genre has only begun to develop, and it is not the only genre in which one could write scientific poetry.<sup>24</sup> The *Argonautica* is

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<sup>21</sup> Netz (2009), pp. 174-229, especially p. 174, where he uses this terminology.

<sup>22</sup> There are no articles featuring Apollonius in Harder, Regtuit, and Wakker (2009), Cusset (2006a), or Horster and Reitz (2005). Zanker (1987) discusses Apollonius in the context of both geography and medicine, and many other broad overviews mention him, see fn. 25 for more bibliography, and especially Netz (2009), pp. 174-76. Arguments that Aratus and Nicander are scientists have been made, most notably by Martin (1998), pp. lxxxvi-cii, and Jacques (2002), pp. xiii-xx, respectively and the two poets are usually discussed in tandem.

<sup>23</sup> Sider (2014a) and Toohey (2005) make this point

<sup>24</sup> Sider (2005), pp. 172-78, argues that Posidippus is writing didactic epigram, not because of any specific educational language in the poems, but because of their scientific content. It might be better, therefore, to suggest that Posidippus is writing 'scientific epigram,' instead.

not a didactic poem, in any sense of the word. There is another reason, however; the scientific subject of the poem, geography, is also treated differently from astronomy and medicine. The status of geography in the Hellenistic period, and its place in the *Argonautica* will be fully explained in Chapter 2; suffice it to say here that it is often considered a ‘soft science.’ I believe that it has also led to Apollonius’ omission from discussions of scientific poetry in the Hellenistic period. These three poets are not the same, but there is one thing that links them together. Both Apollonius and Nicander are heavily influenced by Aratus in their use of signs. The way each poet uses signs will be explained in their respective chapters, but the fact that each of the later poets ties his own use of signs to Aratus shows that signs are, in the Hellenistic Period, a marker of scientific poetry.

## II. Scientific Anecdotes in Hellenistic Poetry

Scientific references are prevalent in Hellenistic poetry, and scholars have remarked upon this phenomenon.<sup>25</sup> The most systematic study is Graham Zanker’s chapter, “The Appeal to Science,” in *Realism in Alexandrian Poetry*.<sup>26</sup> As the title suggests, Zanker situates the use of science within the context of the popularity of *realia* in Alexandrian poetry. For example, in Callimachus’ *Hymn to Delos*, Leto’s labor giving birth to the twins is described in detail: “She loosened her girdle and leaned back with her shoulders against the base of the palm tree, afflicted with enormous pain, and damp sweat flowed out from

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<sup>25</sup> Aside from Harder, Regtuit, and Wakker (2009), mentioned above, it is acknowledged or discussed in Pfeiffer (1968), pp. 123-70; Zanker (1987), pp. 113-31; Fowler (1989), pp. 110-36; Horster and Reitz (2005); Gutzwiller (2007), pp. 174-8; Shipley (2000), pp. 243-47; Cusset (2006a); Netz (2009) pp. 174-229; Cuypers (2010), pp. 332-34.

<sup>26</sup> Zanker (1987), pp. 113-31.

her skin.”<sup>27</sup> This description refers to the famous palm tree mentioned in the *Homeric Hymn to Apollo*, but Callimachus reverses Leto’s birthing position; in the Homeric Hymn, she is kneeling with her arms around the tree.<sup>28</sup> Callimachus’ recumbent birthing position is also recommended in the treatise *On Midwifery* by the great Alexandrian doctor, Herophilus.<sup>29</sup> Callimachus was a near contemporary of Herophilus, and so it has been widely accepted that the poet included this change to the poetic model under the influence of the doctor’s ideas.<sup>30</sup>

The episode encapsulates Zanker’s idea that Hellenistic poets are taking material from the real world and working it into mythical narratives, and it offers a particularly good opportunity to discuss this phenomenon. The advantage of this example is that offers an almost unassailable textual connection between two figures who can also be connected historically. Even better, Callimachus’ poetic model also survives, and so we can determine his departure from it precisely. Interpretations of Callimachus’ decisions for using Herophilus’ birthing position instead of the canonical posture in the Homeric Hymn have typically focused on issues of time.<sup>31</sup> Zanker claims that, “the effect seems to be the ironic ‘correction’ of Callimachus’ model, and to define the distance between the world of myth and contemporary reality, thus again possibly helping the poet’s audience to know where they stand in relation to the mythical past.”<sup>32</sup> As Markus Asper

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<sup>27</sup> Call.H.4.209-211: “λύσατο δὲ ζώνην, ἀπὸ δ’ ἐκλίθη ἔμπαλιν ὤμοις/ φοίνικος ποτὶ πρέμον ἀμηχανίης ὑπὸ λυγρῆς /τειρομένη· νότιος δὲ διὰ χροῶς ἔρρεεν ἰδρώς.”

<sup>28</sup> *h.Ap.* 117-18.

<sup>29</sup> See Most (1981), especially pp. 192-96.

<sup>30</sup> Most (1981), who first points out the connection, but it is also mentioned in Zanker (1987), pp.124-5, Asper (2009), p. 4, Netz (2009), p. 194.

<sup>31</sup> Zanker (1987), pp. 124-25.

<sup>32</sup> Zanker (1987), p. 125

explains more thoroughly, the insertion of modern (i.e., contemporary) scientific knowledge into mythical narratives both makes the story more realistic, bringing modern reality and the mythical past closer together, and, at the same time, draws attention to the distance between them.<sup>33</sup>

This explanation works well for this particular episode, because Herophilus' *floruit* dates so closely to Callimachus' own, that this could really be considered a "cutting-edge breakthrough," inserted into a poem that goes very far back in the mythological past, to the birth of a powerful Olympian deity. But, as mentioned in Section 1, science does not automatically equal 'modern' in this time period. This interpretation becomes problematic for the numerous instances in which Callimachus and Apollonius use information that can be traced back to Aristotle and Empedocles, or for Aratus' use of Eudoxus' writings.<sup>34</sup> Underneath these readings is a modern association between myth and the past and between science and the present. This association correlates with a teleological view of the history of science as a narrative of humankind's transition from superstitious myth to scientific rationalism.<sup>35</sup> This narrative has been thoroughly refuted in the study of the history of science, but the traces of it remain in these readings of the connotations of scientific information in antiquity.<sup>36</sup>

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<sup>33</sup> Asper (2009), p. 16.

<sup>34</sup> Zanker (2009) and Asper (2009) give a number of examples in which Callimachus and Apollonius use Aristotle. On Empedocles in Apollonius' poetry, see especially Nelis (1992) and Kyriakou (1994), who actually sees Apollonius using Aristotle's changes to Empedoclean cosmology. On Aratus and Eudoxus, there are many discussions, although the most complete is Pendergraft (1982).

<sup>35</sup> See Lindberg (1992), pp. 355-68, on the debate about this narrative in the longer span of history of science.

<sup>36</sup> See Lloyd (1979), pp. 10-58, for a thorough overview of this issue.

Moreover, implicit in Zanker's and Asper's readings of this story is the assumption that Callimachus is trading on the authority of Herophilus' new (and presumably, better) *knowledge* of safe birthing techniques to lend credibility to his own narrative of the birth of Apollo. But it is equally possible that Callimachus is actually using his own Muse-granted authority to bestow greater validity on his colleague's ideas. If Leto herself uses this position, then surely Herophilus' recommendation deserves attention. It is most likely that both ways of determining truth-value were in operation at this point, and that Callimachus is both appropriating Herophilus' authority and supporting it at the same time.

Many similar instances of the use of scientific information recur throughout Callimachus' corpus and that of other Hellenistic poets.<sup>37</sup> Even more may be present, but undetectable because of the fragmentary state of Hellenistic literature. I refer to these as "scientific anecdotes," and they fit well with our general understanding of Hellenistic poetry's fixation on learned marginalia and hidden references.<sup>38</sup> These anecdotes tell us little about either the poetry or the science, but if poets felt their audience would recognize these references, in the same way they would recognize a particularly marked Homeric word, it suggests that scientific writing was not relegated to a specialist audience, but was read more widely by the (admittedly still small) learned community.<sup>39</sup>

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<sup>37</sup> Cuypers (2010), p. 332, gives a close to exhaustive list, with bibliography for specific passages.

<sup>38</sup> See Zanker (1987), p. 113; Fowler (1989), pp. 110-11; Hatzimichali (2009) for how these scientific references fit into this trend.

<sup>39</sup> The question of the audience of Hellenistic poetry has been hotly contested, with two main theories: 1) that these poets write for their own small elite learned community, as advanced by Bing (1988), especially p. 17 on the breakdown of the social role of poetry, and 2) that in fact, public performances of poetry continued throughout the Hellenistic period and that it was, in fact, still a popular medium, as argued by

In contrast to the works in this dissertation, these scientific anecdotes do seem ancillary. The poetry of Aratus, Apollonius, and Nicander use science in a way that is more important than this.<sup>40</sup> These poets are not just taking small tidbits of information, culled from other sources, and inserting them into their works, but are offering a coherent argument about a subject. Scientific knowledge at this time (or at any time) is not static, finite, or neutral, and it is important to remember that a poet's choice in inserting any detail is not merely between providing that specific piece of information (with a clear provenance from a prose work) and omitting the subject altogether. These poets choose what to include, what to exclude, how to organize it, and what theoretical framework to use to explain it: all decisions that show this knowledge is dynamic, diffuse, and partisan. They communicate ideas and theories for their own goals, and in the process evince a richer relationship between science and poetry than these small anecdotal passages can provide.

### III. Defining Ancient Science

I have claimed that we should see these texts as works of science, but to do so, I must explain what I mean by "science." It would be meaningless for me to argue that these poems represent works of ancient science, and then to define it in a way that drastically

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Cameron (1995). This debate has largely centered on the role of writing and oral performance, however, and the question of scientific knowledge expected has not been discussed. Asper (2009), especially p. 16, assumes a reader of Callimachus who will immediately recognize the Aristotelian and Herophilean influences, although he never specifies whether this is an ancient or a modern reader.

<sup>40</sup> There are, in fact, many such scientific anecdotes in Apollonius' *Argonautica*, especially on the subject of medicine. See Zanker (1987), pp. 116-18; 125-26; Cuypers (2010), p. 332, in which his use of geography is not distinguished from these other disciplines. Netz (2009), pp. 174-76, argues, as I do, that there is a difference in how Apollonius uses geography, and in this dissertation, the geography of the *Argonautica* will be the primary focus, as it represents a more important part of the larger work than these smaller moments.



departs from any other definition of the term. Paul Keyser and Georgia Irby-Massie define science as the attempt “to understand or model some aspect of the natural world on the basis of investigation and reason.”<sup>41</sup> I have adopted this as my own frame of reference. The three poets in this dissertation all discuss natural phenomena in their poetry, and one of the crucial ways in which their work is *scientific* is their frequent use of signs. Each poet repeatedly returns to the presence of signs: in the sky, on the landscape, in a wound. For these poets, seeing the evidence is an important aspect of the information they provide, and this empiricism reflects the scientific nature of their poetry. There are two major components of Keyser and Irby-Massie’s definition, content and methodology, and in the following I will address how these two have figured in attempts to define science in antiquity.

There is a subset of scholarship on ancient science dedicated to arguing that particular ancient figures deserve to be considered scientists by modern standards. Recently, Daniel Graham has argued that certain Pre-Socratic thinkers should be considered scientists, particularly Anaxagoras and Parmenides.<sup>42</sup> Lucio Russo has also argued similarly for Archimedes and Euclid, and he even goes so far as to suggest a first “Scientific Revolution” in the third century BCE.<sup>43</sup> Russo focuses on methodology in his arguments, and this will be discussed below in further detail. Graham’s argument, however, is content-based, but it is most centered on the accuracy of their ideas.<sup>44</sup> That

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<sup>41</sup> Keyser and Irby-Massie (2008), p. 1. See also Cuypers (2010), p. 331.

<sup>42</sup> Graham (2013). See also Sider (2014b).

<sup>43</sup> Russo (2004).

<sup>44</sup> Graham (2013), p. 39, justifies this emphasis on success while critiquing other methods of studying the history of science: “What they all miss is what makes science scientific: its ability to get things right, and to improve successively on its own understandings. If, however, substantive progress is what characterizes

is, Anaxagoras' correct deduction that the light of the moon is reflected from the sun rather than emitted by the moon itself demonstrates his status as a scientist.<sup>45</sup> This is an extremely problematic way of defining science, as Geoffrey Lloyd has articulated:

If science is defined primarily in terms of the ambition to understand the world around us, that is widespread, if not universal. Of course what passes as understanding is often mistaken. But then even modern science makes mistakes. We cannot define science merely in terms of success, for that is always provisional.<sup>46</sup>

Russo's methodological approach is more useful, but ends up being more prescriptive than descriptive, as he must exclude from his conception of science any author who does not fit his narrow definition.<sup>47</sup> These two books show that one can use a thoroughly modern definition of science to discuss authors from the past, even though the practice of science was so drastically different from what it is today. In this dissertation, however, I do not feel it would be worthwhile to do so, because of the limited scope of such a project. Instead, I want to situate these poets within a context of ancient study of the natural world, and this requires understanding the practice of science in antiquity rather than importing a modern understanding of the subject. As Lloyd has said, "to study what passes for science in a society is to go to the centre of the values of that society."<sup>48</sup>

Graham and Russo's work shows that there is continuity between ancient and modern study of the natural world, and I use this as a justification for using the word "science,"

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science, progress itself can serve as a kind of criterion for identifying instances of science in history." There is certainly value in this approach, but as even Graham acknowledges, p.38, this is "a lot like old-time history of science." The advantages of this type of survey are, in my view, outweighed by the omission of any historical context. Why authors get things wrong is, to me, far more interesting.

<sup>45</sup> Graham (2013), pp. 109-36.

<sup>46</sup> Lloyd (2009), p. 161. See also Rihll (1999), p. 8, on the problems with this type of approach.

<sup>47</sup> Such as, for example, Theophrastus, whom he does not include in his definition, but instead classifies botany as an 'empirical science,' see Russo (2004), pp. 158-65. On Theophrastus as a scientist, see Rihll (1999), pp. 116-18; French (1994), pp. 83-113.

<sup>48</sup> Lloyd (1985), quoted in Rihll (1999), p. 7.

but I do not find the ways in which these authors are not like modern scientists problematic.<sup>49</sup>

Even today, the term “science” is used broadly in a number of contexts, and none of these definitions maps perfectly onto any discipline, practice, or methodology from antiquity. ἐπιστήμη is traditionally considered the closest Greek term, but φιλοσοφία, σοφία, σοφιστής, ἱστορία, φύσις, and μαθηματική are all applied frequently to the same enterprises, even though their ancient meanings are not precisely equivalent to the term “science.”<sup>50</sup> In this section, I will consider modern attempts to define science and how they relate to our understanding of its practice in antiquity.

David Lindberg lays out eight possible ways of defining science, which offer an extensive, if not exhaustive, representation of the variety of approaches.<sup>51</sup> Many are incompatible with each other: science can be defined primarily by its technological applications in the real world, or by its grounding in theory and abstraction, thereby excluding technology. Alternatively, it can be defined by the use of axiomatic rules (in which Boyle’s law is often invoked as an example), or by its methodology, namely, the use of experiments. Its epistemological authority can be considered the defining characteristic (often to serve as a contrast to religion), or its content (the natural world), or even its values, especially objectivity and precision. Or, Lindberg suggests finally, and

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<sup>49</sup> Rihll (1999), p. 3, discusses how the abstraction of ‘science’ leads to anachronisms, and that this is not unique to this particular branch of history. She provides the analogy of the word ‘school,’ which means something very different in ancient and modern contexts, but surely the same is also the case for ‘city,’ ‘religion,’ or even ‘poetry.’ I do not dispute the need to clarify one’s definition of ‘science,’ but wish to point out that offering a different meaning of a word for ancient contexts is a prevalent practice.

<sup>50</sup> Laks (2005), p. 9, offers a lengthy list, although he does not mention doesn’t include *episteme*, which Rihll (1999), p.2, Keyser (2013), p. 18, do.

<sup>51</sup> This paragraph is a summary of Lindberg (1992), pp. 1-3.

somewhat aporetically, science can be “general terms of approval—epithets that we attach to whatever we wish to applaud.”<sup>52</sup> Lindberg lays out these options as various possibilities, but they are really each a facet of a general modern definition of science, and their use is contingent upon which aspect of modern science we most want to consider in the ancient sources.

Lindberg’s division of a modern definition into its component parts illustrates the main paradox in creating a definition of ancient science. As Russo has articulated the issue,

One cannot approach the problem of characterizing the scientific method without being familiar with the science that did in fact evolve through the centuries, that is, without knowing the history of science. On the other hand, any history of science must obviously presuppose a definition, if perhaps tacit or even unconscious, of science.<sup>53</sup>

For example, Lindberg probably includes the relationship between scientific epistemology and religion as one possible definition because of the historical tension between the Catholic church and figures such as Galileo. There is very little evidence in ancient sources that such a contrast was a particular issue.<sup>54</sup> Russo’s chicken-or-egg formulation of the problem is illuminating because it allows the problem to be simplified from Lindberg’s eight component parts into a much more manageable split between two

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<sup>52</sup> Lindberg (1992), p.2

<sup>53</sup> Russo (2004), p. 16.

<sup>54</sup> One possible instance where science and religion may have been in conflict is medicine, where it is possible that healing cults and professional doctors competed for clients. See Nutton (2004), pp. 110-11; 279-81.

overarching categories. I will refer to these methodologies in defining ancient science as “normative” and “descriptive.”<sup>55</sup>

Normative definitions of science, such as Graham’s and Russo’s, privilege abstract ideas of science over historical contextualization. Russo, for example, limits his discussion to the exact sciences, which are, by his definition, grounded in the theoretical, “rigorously deductive,” and can be applied to real world only on the basis of specific, narrow “correspondence rules.”<sup>56</sup> This, in effect, limits his discussion almost entirely to mathematics and geometry as practiced by Archimedes and Euclid, the only ancient authors who adhere to these standards.<sup>57</sup> Although he also discusses so-called “empirical” sciences, such as biology and medicine, in passing, they do not qualify as science by his definition. This seems needlessly restrictive and ignores the possibility that some ancient authors were not motivated by the same objectives as he is.<sup>58</sup>

Archimedes’ *Methods* outlines a set of standards for his own work that comes close to Russo’s, but this practice does not seem to have been shared by other authors in antiquity.<sup>59</sup> By only studying those texts that ascribe to the same values as our own, he offers a highly selective account of the ideas circulating in that time period.

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<sup>55</sup> This dichotomy, and the advantages and disadvantages of both sides, is described by Lloyd (2009), pp. 155-66, where he terms the different approaches “narrow” and “broad.”

<sup>56</sup> Russo (2004), p. 17, is one of the most restrictive. A similar approach is offered by Zhmud (2006), p.11, who also limits his study to the exact sciences, because “it is in the realm of the exact sciences that we find the closest possible match between ancient and modern *concepts* of what science is as well as between ancient and modern *practice* of scientific research,” italics in the original.

<sup>57</sup> Russo (2004), pp. 39-55.

<sup>58</sup> As he himself allows to be possible, Russo (2004), p.21.

<sup>59</sup> On Archimedes’ unique-ness in many ways, including his methodology, Netz (2009), especially pp. 14-16. See also Russo (2004), p. 20.

The lack of complete correspondence between our own methods and those of antiquity also creates problems with terminology for historians of ancient science who adopt normative definitions, but still wish to study a wider range of texts. Roger French, for example, decides to abandon the term altogether, and he describes his source texts as “natural histories.”<sup>60</sup> This hardly seems a practical solution, not only because of the prolixity it engenders, but also because we would encounter the same difficulties with a rigorous definition of both “nature” and “history.”

Normative definitions tend to use methodology as the necessary characteristic of science, separating works on natural phenomena that qualify as science from those that do not on the basis of how arguments are made. In contrast, descriptive definitions of science are by nature more catholic, as they are built upon historical practice. Descriptive definitions use content as the primary defining element, which necessarily leads to a wider range of materials being included. As Tracey Rihll and Lloyd have argued, this type of definition gives fairer treatment to the “variety of theories, ideas, and opinions” that can be classified as scientific in antiquity.<sup>61</sup>

Lloyd in particular has argued against adopting a narrow definition of science based on methodology rather than content.<sup>62</sup> A narrow definition, in effect, limits science exclusively to its performance in the last two centuries in the Western world, which is useful when one is trying to articulate why our understanding of the universe is more

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<sup>60</sup> French (1994), pp.ix-xiii. He uses, pp.xi-xii, Lindberg (1992), pp. 1-3, as the basis of his definition of science, but still rejects the idea that we can use the term at all in looking at the ancient world.

<sup>61</sup> Lloyd (1989), 353. See also Rihll (1999), p. 7.

<sup>62</sup> Lloyd (2009), pp. 5-27, attempts to define ‘philosophy’ as a discipline, and points out that the correlation is reversed from science: narrow definitions of philosophy rely on content, whereas broad definitions are based on methodology.

correct than that of the ancients, but it ignores the fact that science has developed continually over the course of history, and no single discovery or thinker ‘invented’ science.

Broader, descriptive definitions have difficulties as well. For Lloyd, whose interests lie in cross-cultural comparison, the main problems inherent to a wider definition of science reside in the question of the “differential actualization of [universal] potential” among cultures.<sup>63</sup> The problem is less relevant for this dissertation, because it is focused on a single culture. There remains an analogical problem, however, of distinguishing scientific inquiry from other discussions of the natural world. I am advancing a claim that the set of ancient texts qualifying as scientific needs to be expanded, and so this question is especially pertinent. Although my own definition is primarily contingent on the subject matter in question (i.e., natural phenomena), it is impossible to exclude methodology entirely from consideration, for this reason. But what methodology should be considered essential to the definition?

The best answer to this question is multifold. Even today, there is no single methodology used by every single scientific discipline. In his important study, *Styles of Scientific Thinking in the European Tradition*, A.C. Crombie created a list of styles that can be in effect in scientific practice at any given time: 1) postulational (as in mathematics), 2) experimental, 3) hypothetical-analogical 4) taxonomic, 5) statistical, and 6) genetic (as in historical evolution).<sup>64</sup> Of these styles, the first four are the most

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<sup>63</sup> Lloyd (2009), p. 161

<sup>64</sup> Crombie (1994), Hacking (1982); (1992) further subdivides 1 and 3 and refines these categories. See also Kwa (2011); Lloyd (2009), pp. 166-67.

prominent in antiquity, and the fourth, the focus on organization of information, was of particular importance in the Hellenistic period, and the previous century. Aristotle's biological works almost all fall into this stylistic category, and we must assume that Eudoxus' star catalog was of the same nature.<sup>65</sup> Scholars have frequently discussed the interest of Hellenistic authors in organizing information: the work of Callimachus and the librarians in Alexandria being the most notable example.<sup>66</sup> This same interest was also evident in the sciences at this time: Theophrastus' botanical writings, Hipparchus' star catalog, and Eratosthenes' spheroidal system of structuring landmasses all show a similar interest in collecting information into one source and arranging it clearly.<sup>67</sup> This same interest can be seen in the three poets discussed in this dissertation. This interest in taxonomy represents a unifying link between works deemed poetic, scholarly, and scientific, and demonstrates the fluid boundaries between these terms for this time period. Each poet in this dissertation shows an interest in organizing large amounts of data in a coherent way and each comes to a different conclusion about how that should be done. This organizational effort is a major component of each poet's contribution to science. Aratus' poem is the earliest extant catalog that has a specific and intentional order to it, and the organization does seem to be his own design, not that of Eudoxus.<sup>68</sup> This is not a slight accomplishment: there is no single, obviously best way to arrange a catalog of the

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<sup>65</sup> Aristotle's taxonomy is a subject with a large amount of bibliography, Rihll (1999), p.109, n.21, provides a good starting place with the bibliography, see especially Lloyd (1996a) and Lennox (1991); On Eudoxus' works, Neugebauer (1975), vol. 2, pp. 675-83, Duke (2002). The distinction between observational (and organizational) and theoretical astronomy (the latter might be called cosmology) goes back at least to Plato, see Gregory (1996).

<sup>66</sup> See Pfeiffer (1968), pp. 126-33; Fraser (1972), pp. 452-56.

<sup>67</sup> On Theophrastus' organizational structure, see French (1994), pp. 83-113, on Eratosthenes', Roller (2010), pp. 15-30; on Hipparchus' star catalog, Neugebauer (1975), pp. 277-92; Duke (2002).

<sup>68</sup> See Pendergraft (1982) on differences in the arrangement of material in Eudoxus and Aratus, and Martin (1998), pp. lxxxvi-xcvii, on the possibility that the text in Hipparchus is not Eudoxus' actual treatise.



stars and constellations, and the sheer volume of information makes some system of arrangement a necessity. Aratus offers a very understandable organization of the night sky. In so doing, he shapes his his project in much the same way as the catalogs of Eudoxus, Hipparchus, and much later, Ptolemy. In a not dissimilar way, Apollonius constructs a narrative map of the *oikoumene*, compiling records to create a coherent whole, organized by the conceit of Argonautic episodes. And by the same token, the structure of Nicander's *Theriaca* is determined by biological taxonomy.

Grouping all of these writers—not just the poets, but also Hipparchus, Theophrastus, Archimedes, and others—under the umbrella term “science” is still problematic, because of the implicit assumption that all of these figures envisioned their works as fundamentally analogical. There are threads of connection between each of these authors and between the disciplines that they focused on, but it is equally true that the different subjects of their work also separates them from each other.<sup>69</sup> The level of differentiation between the individual scientific disciplines has been a subject of much debate, although this debate has focused on the fifth century BCE. Leonid Zhmud argued for complete fragmentation, as each discipline splits off from the monolithic origin of philosophy.<sup>70</sup> Lloyd, in contrast, has argued for a much greater amount of fluidity between the interests of philosophers and scientists of all stripes in this early period.<sup>71</sup> Laks responds to both scholars by introducing the separate concepts of specialization,

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<sup>69</sup> The notable exception being Eratosthenes, who worked in almost every subject imaginable, but that was remarkable enough to engender his nickname.

<sup>70</sup> Zhmud (1994), p. 4. See also Laks (2005), p. 8.

<sup>71</sup> Lloyd (2002).

professionalization, and differentiation.<sup>72</sup> Although all three scholars are focused on the Classical (and even Archaic) time period, this separation of terms is particularly useful for considering Hellenistic writers. Eratosthenes himself did not specialize in one subject, but he does seem to have written on differentiated subjects.<sup>73</sup> Professionalization is harder to determine: this will be discussed in the following section, but almost all of the relevant Hellenistic authors were in service to a king, and the exact nature of this patronage is never entirely clear.<sup>74</sup>

The clearest distinction between disciplines that ancient authors describe is the separation of theoretical from applied sciences. Aristotle, for example, writes that:

Indeed, this occurs in the theoretical sciences (τῶν ἐπιστημῶν τῶν θεωρητικῶν), for there is no other purpose of astronomy or of the science of nature or of geometry except to learn about and to contemplate the nature of the subjects of these sciences (although it is true that they may quite possibly be useful to us accidentally for many necessities), yet the purpose of the productive sciences (τῶν δὲ ποιητικῶν ἐπιστημῶν) is something different from science and knowledge, for example the purpose of medicine is health and that of political science ordered government, or something of that sort, beyond mere knowledge of the science.<sup>75</sup>

τοῦτο δὲ ἐπὶ μὲν τῶν ἐπιστημῶν συμβαίνει τῶν θεωρητικῶν, οὐθὲν γὰρ ἕτερον τέλος ἐστὶ τῆς ἀστρολογίας οὐδὲ τῆς περὶ φύσεως ἐπιστήμης οὐδὲ γεωμετρίας πλὴν τὸ γνωρίσαι καὶ θεωρῆσαι τὴν φύσιν τῶν πραγμάτων τῶν ὑποκειμένων ταῖς ἐπιστήμαις (οὐ μὴν ἀλλὰ κατὰ συμβεβηκὸς οὐθὲν κωλύει πρὸς πολλὰ τῶν ἀναγκαίων εἶναι χρησίμους αὐτὰς ἡμῖν), τῶν δὲ ποιητικῶν ἐπιστημῶν ἕτερον τὸ τέλος τῆς ἐπιστήμης καὶ γνώσεως, οἷον ὑγίεια μὲν ἰατρικῆς, εὐνομία δὲ ἢ τι τοιοῦθ' ἕτερον τῆς πολιτικῆς.

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<sup>72</sup> Laks (2005), pp. 15-18.

<sup>73</sup> But there is also some amount of fluidity: Consider in Dicks (1960), the collection of geographical fragments of Hipparchus, fragment 45, pp. 92-93: "The southernmost star of Little Bear, that is the last one in the tail, is reported by Hipparchus to be  $12 \frac{2}{3}^\circ$  distant from the pole." Dicks, pp. 170-72, determines that this comes from a geographical treatise because of it is quoted in Ptolemy's *Geographika* in the context of other fragments of Hipparchus that are more directly geographical, but it underscores just how much the two fields had in common.

<sup>74</sup> See Rihll (1999), pp. 5-6, especially p.6, n. 19, on Archimedes and Hieron.

<sup>75</sup> Arist.*EE*.1216b12-19. Translation adapted from Rackham (1952).

Rihll sees the contrast between λόγος and τέχνη as the equivalent to the distinction between theoretical and applied sciences, but this is a bit too neat.<sup>76</sup> Even in the above-quoted passage, Aristotle admits a certain amount of practical benefit to the theoretical side, however incidental the benefit may be, and he is not always consistent about whether a particular discipline, such as astronomy, should be considered a theoretical or an applied science. Moreover, there is an assumption among most ancient (and modern) authors of the superiority of the theoretical disciplines over applied sciences, although Lloyd suggests that, in antiquity at least, this may be “mak[ing] a virtue out of a necessity,” given the technological constraints on the applied sciences.<sup>77</sup>

The three disciplines in focus in this dissertation—astronomy, geography, and medicine—are not a comprehensive list of the scientific fields that were operative in the Hellenistic period, but they do provide a representative sample. The biological sciences seem to have inspired the most poetry in this time period; apart from the surviving works of Nicander, many other poems about different species of plants and animals are attested from this time period.<sup>78</sup> Mathematical and quantitative subjects seem to be less popular, although there are a series of math problems in the *Palatine Anthology* of uncertain date, and Archimedes and Eratosthenes also wrote similar pieces.<sup>79</sup> The poems in this

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<sup>76</sup> Rihll (1999), pp.13-14.

<sup>77</sup> Lloyd (1996b), p. 44; also Rihll (1999), p. 14.

<sup>78</sup> Flowers and fish seem to have been particularly popular topics, although the fact that many of these works are only known from Athenaeus may provide a certain selection bias. See Heitsch (1963), pp. 51-54.

<sup>79</sup> AP. 14.1-13; 48-51; 116-46, the last group of which is attributed to a Metrodorus, who may have been in the court of Constantine, and Paton (1916), p. 25, believes the others in the Anthology are also by him, so it is possible that none of these come from the Hellenistic period. The level of difficulty of these poems is drastically different from those of Archimedes and Eratosthenes. The epigrams in the anthology are simple algebraic equations, whereas Archimedes' *Cattle Problem* was not solved for over a century, see fn. 520. Archimedes' problem may have been the inspiration for these easier poems, however, as some, like his epigram, adopt a Homeric setting, e.g. AP.14.132.

dissertation may not offer an exhaustive picture of the different scientific disciplines studied in the Hellenistic Period, but they do illustrate a few important issues in modern scholarship on the history of astronomy, geography, and medicine.

Astronomy holds a key position in this dissertation. It is the most mathematically grounded of the scientific disciplines I discuss, but applications are an important aspect as well. Aristotle describes it as one of “those studies that are somewhat physical.”<sup>80</sup>

Aratus’ astronomy avoids mathematical topics, but includes practical applications: he makes the usefulness of the knowledge apparent in the opening Hymn to Zeus and throughout the poem he points out how knowing the arrangement of the constellations is helpful for time-keeping, sea-faring, and predicting the weather. He omits the motion of the planets, as will be discussed in the following section, but his reasons for doing so are not entirely clear. It is possible he did not understand Eudoxus’ explanation of this complicated problem, or he did not feel he could compose interesting and polished verses on the subject, or he did not wish to insert himself into the ongoing debate, which was a topic of interest for the third century authors Aristarchus of Samothrace and Apollonius of Perga, or possibly he felt that erratic motion of the planets would only distract from his message of order and regularity in the universe.<sup>81</sup>

Another issue that emerges in the study of ancient astronomy is the imperfect fit between the boundaries of modern and ancient disciplines. As Rihll has stated, “we

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<sup>80</sup> Arist.*Ph.*194a8-9. “τὰ φυσικώτερα τῶν μαθημάτων” Aristotle likens astronomy to optics and harmonics in this regard, and contrasts it from geometry, which is purely theoretical.

<sup>81</sup> Hunter (1995a) argues for this last possibility, although the first, Aratus’ incompetence, is the most commonly accepted. On the debates about planetary motion occurring in the third century, see Lloyd (1973), pp. 53-74.

naturally tend to organize what we find into categories which reflect our way of dividing up the world into subjects and disciplines. Thus things that the ancients linked together, we tear apart and treat separately. In particular, some we include in the category of science, others we exclude.”<sup>82</sup> This is apparent in the case of astronomy. In antiquity, the words ἀστρονομία and ἀστρολογία were used interchangeably to refer to either subject, and the study of the heavens and the use of this study to predict the future were closely related.<sup>83</sup> Moreover, although we consider astronomy and meteorology to be separate fields of study, they were closely grouped together in antiquity, in part because of their relationship to time keeping.<sup>84</sup>

These modern assumptions have both infiltrated the way we think about Aratus. An old theory postulated that the *Phaenomena* was actually two separate poems, linked together accidentally in the manuscript tradition. This theory was predicated on the disjunction between the catalog of constellations and the weather signs.<sup>85</sup> Even after this argument has been refuted, scholars still acknowledge the awkward connection between the two subjects of the poem, but this awkwardness is only modern.<sup>86</sup> The connection between the constellations and the weather would have been perfectly natural and understandable to an ancient reader. In contrast, Aratus does make a somewhat strange decision in his poem: he omits astrology altogether. Eudoxus was known in antiquity for

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<sup>82</sup> Rihll (1999), p. 1.

<sup>83</sup> LSJ s.v. See Barton (1994), pp. 5-6, on the “closely intertwined” relationship between astronomy and astrology.

<sup>84</sup> See Lehoux (2007), pp. 3-27, especially p. 5 where he coins the term, “astrometeorology,” which may be the best way to describe the subject of Aratus’ *Phaenomena*.

<sup>85</sup> See Kidd (1997), p. 425, who forcefully rejects this older theory.

<sup>86</sup> See, for example, Overduin (2014a), p. 50.

his rejection of astrology.<sup>87</sup> This offers one more possible reason that Aratus does not discuss the planets, since they are important in astrological practices.<sup>88</sup> The omission of the planets does seem to have struck at least one reader, Leonidas of Tarentum, whose epigram on the poem will be discussed in the following section. The presence of meteorology and the absence of astrology have been interpreted as marked and unmarked respectively by modern scholars, but in antiquity, the opposite would have been the case for both. This illustrates the fact that we need to be careful about importing our own assumptions about the boundaries of scientific disciplines into these works.

Unlike astronomy, geography is often described by modern scholars as a ‘soft’ science, or perhaps not even a science at all.<sup>89</sup> I will discuss the problematic nature of geography as a discipline in greater detail in the second chapter, but in this dissertation I will consider it a scientific field, equal to any other discipline under discussion. Ancient geography has one foot in quantitative measurement and another in narrative description, a situation that creates an uneasy balance between the two aspects. Even for the most mathematically inclined authors, however, such as Eratosthenes and Hipparchus, both mathematical measurement and description were essential components.<sup>90</sup> Hipparchus offers a particularly good example for breaking down this particular stereotype. No one can deny his mathematical *bona fides*, and he argued vehemently for using astronomical

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<sup>87</sup> See Kidd (1997), p. 346 on Eudoxus and astrology. On Hellenistic astrology more generally, see Barton (1994), pp. 21-31.

<sup>88</sup> Barton (1994), pp. 95-97. Eudoxus did discuss the planets in his cosmological works, see Lloyd (1970), pp. 82-83.

<sup>89</sup> Lloyd (2009), p. 169, while acknowledging the problems of such a classification; Russo (2004), pp. 66-70, restricts geography as a science to mathematical cartography, contrasting it with, p. 66, “purely descriptive geographical works.”

<sup>90</sup> See Roller (2010), pp. 5-7; 30-31; Meyer (2001).

observations to make more accurate measurements of terrestrial distances.<sup>91</sup> He also believed that Homeric epic could offer information about distant regions. Reconciling these two positions has caused many scholars great consternation.<sup>92</sup> But Hipparchus' opinion seems to have been completely uncontroversial to most ancient readers of his work. The distinction between mathematical and descriptive sciences was not as conspicuous, at least within the field of geography.

Because of its use of both quantitative measurement and description, the study of geography is often divided. Scholars who focus on the former think about it as a science and ignore texts that are primarily or exclusively descriptive.<sup>93</sup> In contrast, those who study its narrative aspects tend to emphasize continuity with other genres such as historiography and ethnography rather than its connection to other scientific disciplines.<sup>94</sup> As a result, texts like Apollonius' *Argonautica* can be discussed as geographical, without being considered scientific. As the examples of Eratosthenes and Hipparchus show, however, such a distinction is problematic.

The level of professionalization and the focus on practical applications make medicine somewhat different from other scientific inquiries, although, as discussed above, these are issues present for any scientific subject, even astronomy.<sup>95</sup> Philosophers such as Aristotle and Theophrastus wrote extensively on medical issues, and even the

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<sup>91</sup> Roller (2010), p. 31. See Dicks (1960), pp. 84-85, for the most explicit fragment of his work on the subject.

<sup>92</sup> This was especially the case in the 19<sup>th</sup> century, see Neumann (1886). Schenkeveld (1976) discusses this.

<sup>93</sup> Such as Aujac (2001).

<sup>94</sup> See Clarke (1999), Romm (1992), pp. 3-8.

<sup>95</sup> On professionalism of medicine, see Nutton (2004), pp. 248-71.

most pragmatic Hippocratic texts show evidence of larger theoretical frameworks informing the doctors' conclusions.<sup>96</sup> The distinction between practicing doctors and writers who focus on issues pertaining to health and the human body is not clear, especially because our biographical information for almost all ancient figures is so incomplete.<sup>97</sup> Medicine and biology are difficult to distinguish; theories about the operation of the body inform diagnoses and much of the interest in plants had to do with their medicinal properties.<sup>98</sup> Nicander's poems have traditionally been considered medical, but the vast majority of the two surviving poems focus more on varieties of biological life forms (snakes, insects, plants) than on the administration of the remedies the plants he names can offer.

On the other hand, the relationship of folk medicine to the practices of educated doctors trained in the Hippocratic tradition (and in biological study) presents another problem in the study of Nicander. There is a lot of debate about the relationship of doctors trained in schools and pharmacologists and root-cutters, who had less formalized education.<sup>99</sup> Nicander seems to draw on both of these traditions, and there is no evidence of an allegiance to a particular medical school in his work.<sup>100</sup> But the level of erudition in his poetry suggests an audience with a high level of education.<sup>101</sup> It is possible that by writing in verse, Nicander is able to draw on a wider range of sources of

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<sup>96</sup> See Rihll (1999), pp. 106-35, who treats both subjects together.

<sup>97</sup> Such as, of course, Aristotle and Theophrastus. See Nutton (2004), p. 141, on 'medical botany.' Rihll (1999), pp. 119-122, details the various different types of reasons people felt qualified to write about medicine.

<sup>98</sup> Scarborough (1978).

<sup>99</sup> On this, see Nutton (2004), pp. 173-75; Korpela (1987); (1995).

<sup>100</sup> Jacques (2002), pp. xx-lxi, on the wide range of authors Nicander uses.

<sup>101</sup> See Overduin (2014a), pp. 127-29, especially n. 465 for bibliography; Bulloch (1985), p. 50, for elite Roman readers of Nicander's poetry.



information than prose writers could. The combination of folk traditions and erudition creates an uneasy balance in these poems and points to a more complicated picture of the relationship between these different approaches to medicine.

#### **IV. Qualifications and Authority for the Scientific Poet**

There is a strain of scholarship that denies any scientific value to these works because of the claim that they are written by non-experts.<sup>102</sup> This claim is ‘proven’ by the fact that they are poets, not scientists.<sup>103</sup> There is a double standard in this assertion, because their authority as poets is never under scrutiny. Since Quintilian at least, some readers have had harsh reactions to the qualities of Aratus’ verses, but these assessments have no bearing on his status as a poet. In contrast, when he presents incorrect information, it seems to automatically disqualify him as a scientist.<sup>104</sup> One can be a good poet or a bad poet, but either a good scientist, or not a scientist at all.<sup>105</sup> In these critiques, there are two implicit suppositions: first, there is an assumption of professionalization in the sciences for prose authors, and second, one’s position as a poet is automatically

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<sup>102</sup> See, for example, Dicks (1960), p. 10, who describes Hipparchus as, “at pains to absolve Aratus himself from blame, who was simply following Eudoxus, and anyway, was a poet and not a professional astronomer.” This line, almost verbatim, is also given in Dicks (1970), p. 154.

<sup>103</sup> This is implicit in the bibliography discussed in fn. 25, such as Zanker (1987). Kidd (1997), p. 16, in the process of defending Aratus’ competence in astronomy, claims he is not a professional astronomer, citing Hipparchus. Cusset (2011b) asks the question outright, and Jacques (2006) asks a similar question of Nicander. Meyer (2001) considers the question of whether Apollonius is a geographer.

<sup>104</sup> See Tueller and Macfarlane (2009). Scarborough (1977), p. 4, depicts Nicander as a poet dabbling in a wide range of subjects he does not understand: “Nicander shows no competence in the subjects or specifics of poisons and toxicology in either the *Theriaca* or the *Alexipharmaca*. Likewise, he borrowed a number of other works as the base of his poetic expositions, in which he had no expertise: his *Prognostics* were a mere paraphrase of a Hippocratic treatise; a *Georgica* revealed ignorance of its subject.”

<sup>105</sup> This is an issue not restricted to this realm of study of the history of science. As Lloyd (2009), p. 157, points out, “the question of identifying the defining characteristics of science in general, and that of demarcating good science from bad, have repeatedly eluded resolution and sometimes been run confusingly together.”

privileged. I have never seen a scholar suggest that Aratus isn't really a poet, because he wrote about astronomy.<sup>106</sup>

Nevertheless, this dissertation will not argue that we should consider Aratus (or Apollonius or Nicander) a scientist. Increasingly, doubt has risen about our ability to say that *any* ancient author can be considered a professional scientist.<sup>107</sup> Medicine is something of an exception to this, but, as stated above, not all the surviving medical writing was written by practicing doctors.<sup>108</sup> For this reason, I will avoid using the term “scientist” to refer to any of the authors under discussion in this dissertation. Instead, I will consider the ways in which the poems can be considered *scientific*, as defined in the previous section. This approach will focus on the texts themselves, rather than wading into the murky waters of the biographical tradition and the later reception of these texts. However, the reception of Aratus in particular has figured heavily in previous discussions of his authority in the *Phaenomena*, and in the following, I will explore the ways in which scholars have sought to determine Aratus' level of competence. Ancient reception of the poem reveals a similar debate occurring then, but a comparison shows that ancient readers of the *Phaenomena* chose to trust (or not to trust) the poem on very different grounds than those modern scholars use to decide Aratus' competence. The same type of discussion is not attested to same extent for Apollonius and Nicander. I would suggest that the well-documented use of Aratus' *Phaenomena* as a teaching text would prompt a particularly vital discussion of this question in a way that may not have

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<sup>106</sup> Aristotle, famously, does declare that Empedocles is more a *physiologos* than a poet. See p. 59, especially fn.194 .

<sup>107</sup> See Rihll (1999), pp. 4-6, on this issue, in which she draws a direct connection to our inability to talk about tragedians as professional poets.

<sup>108</sup> Such as the writings of Aristotle and Theophrastus, see Rihll (1999), pp.106-35.

been as necessary for Nicander and Apollonius, whose works were not as widely read later for their scientific content.<sup>109</sup>

The assumption of a professional status for the scientist has led to an over-reliance on the appellations used for these figures. For example, Michael Tueller and Roger Macfarlane attempt to find a distinction in Hipparchus' treatment of Aratus and his prose-writing predecessor Eudoxus, by claiming that Hipparchus sees Eudoxus as a “μαθηματικός,” like himself, but does not view Aratus in the same way.<sup>110</sup> Tueller and Macfarlane point to a line in the commentary in which Hipparchus seems to exclude Aratus from the “μαθηματικοί,” but this argument is belied by another passage in which Hipparchus explicitly includes both Aratus and (Eudoxus) in this group.<sup>111</sup> Hipparchus' inconsistency shows that these terms do not have the same weight for him as they do for us. Conversely, Jacques has used the fact that the Suda refers to Nicander as “ιατρός” as evidence that he was a court doctor in the service of Attalus III in Pergamon.<sup>112</sup> The Suda's evidence is not especially trustworthy, because none of the other biographical information about Nicander suggests that this was the case.<sup>113</sup> In fact, he is more commonly said to be a priest in the sanctuary of Apollo at Claros, although even this information is uncertain.<sup>114</sup> Apollonius' position as Head Librarian and Royal Tutor at

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<sup>109</sup> On Nicander's later readers, Hatzimichali (2009). On Apollonius, see Meyer (2001).

<sup>110</sup> Tueller and MacFarlane (2009), p. 237.

<sup>111</sup> Hipparch. 1.1.9 and 2.2.19, respectively. Tueller and Macfarlane explain this second reference, p. 237, as “a less guarded moment.”

<sup>112</sup> Jacques (2002), pp.xvi-xx; (2007), pp. xiii-xvi. See also Overduin (2014a), pp. 6-9.

<sup>113</sup> AP. 9.21 does include Nicander in a list of doctors with Apollo, Cheiron, Asclepius, and Hippocrates.

<sup>114</sup> Overduin (2014a), pp. 5-6. This idea comes from his references in both poems (*Ther.* 957-58; *Alex.* 9-11) to his connection to Claros, which was primarily known for its sanctuary of Apollo, see Parke (1985), pp. 112-70.

Alexandria seems somewhat more secure, although neither of these professional occupations necessarily have any bearing on his role as poet or geographer.<sup>115</sup>

In short, biographical information about Aratus, Apollonius, and Nicander cannot be used to make an argument about their authority to discuss their chosen subjects, either in favor or against. The choice of later writers to refer to these figures as poets or as astronomers, geographers, or doctors seems to be entirely dependent on the context of the discussion and not on a claim of professional status. For example, Athenaeus at one point refers to Eratosthenes not as a geometer, astronomer, or geographer but as the poet from Cyrene.<sup>116</sup>

A similarly problematic way of addressing this issue is to consider other works attributed to our writers. It is true that Aratus' *Kata Lepton* show little interest in astronomy, and Nicander's body of work includes some poems that sound as if they might have had scientific subjects and others that do not.<sup>117</sup> Apollonius' *ktisis* poetry could be used to argue that he was interested in geography or that he was not interested in larger questions and only in localized topography.<sup>118</sup> Aside from the unreliability of our knowledge about these works, this approach treats these authors differently from others who left prose treatises that have survived. Plato and Aristotle composed poetry, and substantial fragments of poems by Eratosthenes survive as well, but this has not

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<sup>115</sup> On the professional responsibilities at the Library and Mouseion in Alexandria, see Pfeiffer (1968), pp. 144-48; Fraser (1972), pp. 305-479; Shipley (2000), pp. 235-43. On Apollonius' role more specifically, see Lefkowitz (2001).

<sup>116</sup> *Deipn.* 1.2b = Eratosth. fr. 30, p. 65 Powell.

<sup>117</sup> On Aratus' other poetry, Lloyd-Jones and Parsons (1983), pp. 108-89 and Cameron (1995), p. 324. On Nicander, Gow and Schofield (1953), pp. 138-67; 201-220, and Scarborough (1977), p.4, quoted above in fn.104.

<sup>118</sup> See Sistikou (2008).

prevented scholars from reading their them as experts in the topics covered by their prose works.<sup>119</sup> If neither composing poetry nor practicing science was the sole professional obligation for these authors, how much time must a person spend in any given practice to be considered an authority in it? This is, of course, an unanswerable question, and it illustrates the problems with this approach.

The argument used most frequently by modern authors to deny any scientific value to these works is their reliance on prose sources. For each of these authors there is an earlier prose author, some better attested than others, who is identified as the source of their information. Although the relationship between these texts is often portrayed as definite, that is not always the case. Aratus' use of Eudoxus is the best attested of these relationships. Hipparchus begins his commentary with an extended proof that Aratus used Eudoxus' works extensively, quoting parallel passages from both authors to demonstrate his argument.<sup>120</sup> In addition, several of the extant lives of Aratus recount a story in which his patron, Antigonus Gonatas, gave him a set of Eudoxus' writings and charged him to make them 'εὐδοξότερον.'<sup>121</sup> But the evidence is less convincing for Apollonius and Nicander. The scholia claim Apollonius relied on Timagetus, an author we only know from this source.<sup>122</sup> The prose work behind Nicander's poetry, a

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<sup>119</sup> For the fragments of Aristotle's poetry, see West (1972), pp. 44-45; Page (1962), p. 444. For Plato, Snell (1971), p. 186; Diehl (1949) pp. 102-110; Beckby (1965-68), pp. 5.78; 80; 6.1;43; 7.99-100; 256; 259; 265; 268; 269; 669; 670; 9.3; 44; 51; 506; 747; 823; 16.13;160; 161; 210; 248.

<sup>120</sup> The argument is first announced in Hipparch.1.2.1 and continues for the remainder of Book 1.

Pendergraft (1982) offers a thorough comparison of the discrepancies between the parallel passages.

<sup>121</sup> The story is told in its most complete form, with the pun, in Vita I, using Martin (1956)'s ordering. See also Kidd (1997), p.4, Martin (1998), pp. xii-xv; Dickey (2007), pp. 56-57, on the lives. Gabbert (1997), pp. 68-72, discusses Antigonus Gonatas as a patron to intellectual figures, but portrays him as more interested in philosophy than poetry, however, and barely mentions Aratus.

<sup>122</sup> See Meyer (2001).

toxicological treatise by a figure named Apollodorus, is even more dubious; it seems to be almost entirely a modern fabrication.<sup>123</sup>

Even the most securely attested relationship, Aratus' use of Eudoxus, has been questioned; Jean Martin has argued that the work Hipparchus is quoting postdates Aratus' *Phaenomena*, and therefore cannot be by Eudoxus.<sup>124</sup> He suggests that Hipparchus had a wrongly attributed text and was in fact using a prose summary of Aratus' *Phaenomena*.<sup>125</sup> Martin's argument is not especially convincing, because it is based on assumptions about Aratus' literary practices rather than chronological inconsistencies in the astronomical measurements, but Douglas Kidd has also identified passages in which Aratus probably relied on personal observations, which indicates that the poet was not entirely dependent on any one source.<sup>126</sup>

I do not wish to suggest that these authors did not use prose sources, perhaps even slavishly. The exact amount of reliance is unknowable, given the loss of these earlier works. Even if the authors intended to imitate these earlier works perfectly, it would be impossible to do so, and since we cannot study Eudoxus, Timagetus, and Apollodorus the toxicologist, this type of *Quellenforschung* is unproductive. There is an implicit claim that by the use of earlier prose texts, these poets reveal themselves to be "amateurs," but

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<sup>123</sup> Jacques (2002), p. xxxiv, n.54, gives a good overview of how the connection between Apollodorus and Nicander was made.

<sup>124</sup> Martin (1998), pp. lxxxvi-cxxv. His argument focuses on the different arrangement of the simultaneous risings and settings of constellations in the two texts, claiming that the prose text seems to be rearranged specifically to correct problems in Aratus' poem, which would be impossible if it were the source text. It is therefore an argument based on the organization of the works and not on any astronomical data. Previously, Höpkin (1905), pp.1297-3000, Böker (1952), pp.1-9; 31-35, and Erren (1967), pp. 192-200, believed the star positions in the fragments quoted by Hipparchus suggested that the source text was a few centuries older and erroneously attributed to Eudoxus, but this was refuted convincingly by Neugebauer (1975), pp. 675-77 and Lasserre (1966). See Pendergraft (1982), pp. 6-7, on this argument.

<sup>125</sup> Martin (1956), pp. 196-202, argues that all the *vitae* derive from a work composed by Theon of Alexandria in the 1<sup>st</sup> cent. BC. On discrepancies between the different lives, see Kidd (1997), pp. 3-5.

<sup>126</sup> Kidd (1997), pp.16-17.

this was a prevalent practice in scientific prose writing as well. Aristotle's cosmology is almost entirely based on Callippus and Eudoxus, and although scholars do not have a high regard for the quality of Aristotle's astronomy, it still merits discussion *qua* astronomy.<sup>127</sup> Even Hipparchus, who argues vociferously for basing one's research on personal observations, must have relied upon on the works of others. His discovery of the precession of the equinoxes necessitates records for astronomical observations made in time periods longer than a human life span.<sup>128</sup> Because of the logistics of travel, neither Nicander nor Apollonius could have observed all of the phenomena they describe; but the same is true for Theophrastus and Eratosthenes.<sup>129</sup> The fact that the poets used writings by earlier authors does not distinguish them from prose writers, nor does it point to a lack of knowledge in their subject.

These methods of constructing authority do not apply, but ancient scientific writers also needed to prove their works were trustworthy, and this is true in both prose and verse. There were already in antiquity real questions about whether Aratus was an authority on astronomy. Ancient authors present a conflicted picture of Aratus' competence in astronomy. Cicero refers to him as "hominem ignarum astrologiae," whereas Vitruvius includes him in a list with Eudoxus, Euctemon, Callippus, Meton, and Hipparchus, without making any distinction for the poet.<sup>130</sup> These are both offhand remarks, but the *vitae* of Aratus show that there was an ongoing debate about the specific

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<sup>127</sup> There are, in fact, more references to direct observations of the sky in Aratus' *Phaenomena* than in all of Aristotle's *De Caelo*, see Dicks (1970), p. 259, n.375, who states that Aristotle offers only one observation in the entire *De Caelo* (2.12.292a3-6), and does so incorrectly. For his dependence especially on the work of Callippus, see Dicks (1970), pp. 190-219, esp. p.194. Evans (1998), pp. 306-311, nevertheless rightly shows how Aristotle adapted and modified the ideas in these works.

<sup>128</sup> See Jones (1991): Hipparchus mainly used Babylonian records for his computations.

<sup>129</sup> We have good evidence of Eratosthenes' use of earlier works, see Roller (2010), pp.17-20.

<sup>130</sup> Cic.*De Orat.*1.69; Vitruv.9.6.3.

question of whether he was a real astronomer.<sup>131</sup> The *vitae* are all in agreement that Aratus was perfectly qualified to write the poem. For example, Vita I specifically states that he was asked by Antigonus Gonatas to compose the *Phaenomena*, because he was “εὐδοκμήσας ἔν τε τῇ ἄλλῃ πολυμαθείᾳ καὶ <τῇ> ποιητικῇ.”<sup>132</sup> But the fact that all the *vitae* assert this suggests that others felt differently.

Vita I, after making the above-quoted claim, refers to a theory that Aratus was a doctor and Nicander an astronomer, and Antigonus Gonatas intentionally gave them poetic assignments in the other’s area of expertise, reporting the idea that, “Ἄρατον μὴ εἶναι ἐπιστήμονα τῶν οὐρανίων μῆτε Νίκανδρον τῶν ἰατρικῶν.”<sup>133</sup> This story is mentioned in Vitae II and IV as well, albeit with slight differences, and refuted in all of them, on chronological grounds, rather than on the basis of their expertise.<sup>134</sup> Vita III gives a slightly lengthier discussion of the issue, from a different angle. After recounting the story of Antigonus Gonatas giving Aratus a copy of Eudoxus’ works, he writes:

For this reason, some of those weakly attacking his explanations hold that Aratus was not an astronomer. For they assume that he did not include anything other than Eudoxus’ *Phaenomena* in his work. Hipparchus of Bithynia is of this opinion. For in his *Against Eudoxus and Aratus*, he tries to demonstrate this. And Dionysius agrees with him... in his *On the comparison of Aratus and Homer on astronomy*, he says, ‘We do not make him a doctor, because he wrote *Medicines*, nor will we make him an astronomer, because he says nothing unfamiliar from the works of Eudoxus.’ But they argue unreasonably. For it is a part of scientific knowledge to know how to paraphrase it. And we will find that he grasped most of Eudoxus very carefully.

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<sup>131</sup> The surviving biographical sources for Aratus have been collated in Martin (1956), whose ordering I use in referring to them.

<sup>132</sup> Vita 1.8.4-5.

<sup>133</sup> Vita 1.8.41-43. See Martin (1956), p. 178, for the evidence that Aratus wrote poetry on medical themes.

<sup>134</sup> For a complete overview of the different information in these biographies, see Martin (1956), pp.151-95; Kidd (1997), pp. 1-3, gives a brief summary of the discrepancies.



ὄθεν τινὲς τῶν ἀπαλωτέως προσερχομένων ταῖς ἐξηγήσεσιν ἔδοξαν μὴ μαθηματικὸν εἶναι τὸν Ἄρατον. ὑπέλαβον γὰρ μηδὲν ἕτερον τῶν Εὐδόξου Φαινομένων [ποιῆσαι] αὐτὸν εἰς τὸ σύγγραμμα θεῖναι. ταύτης δὲ τῆς γνώμης ἔχεται καὶ Ἰππαρχος ὁ Βιθυνός. ἐν γὰρ τοῖς Πρὸς Εὐδόξον καὶ Ἄρατον πειρᾶται τοῦτο ἀποδεικνύει. Συναγορεύει δὲ αὐτῶ καὶ Διονύσιος ... ἐν τῷ Περὶ συγκρίσεως Ἀράτου καὶ Ὀμήρου περὶ τῶν μαθηματικῶν, ὅσπερ γέ φησιν “οὐ τίθεμεν αὐτὸν ἱατρὸν εἶναι γράψαντα Ἰατρικὰς δυνάμεις, οὐδὲ μαθηματικὸν θήσομεν οὐδὲν ξένον εἰπόντα τῶν Εὐδόξου.” Βιάζονται δ’ οὐ μετρίως. ἦν γὰρ καὶ τὸ εἰδέναι μεταφράσαι ἐμπειρίας μαθηματικῆς. εὐρήσομεν δὲ αὐτὸν καὶ ἐπιμελέστερον τὰ πλεῖστα τοῦ Εὐδόξου ἐπιστάμενον. (Vita III. 16.20 – 18.13)

This passage gives us a great deal of information about the use of Aratus’ *Phaenomena* in antiquity. Someone, perhaps such as this otherwise unknown Dionysius, felt it necessary to write a treatise that evidently critiqued the astronomical ideas of Aratus and Homer.

This passage also provides an ancient parallel for the modern argument that Aratus was not an astronomer because of his dependence upon Eudoxus’ works. But the author of Vita III refutes this argument with the intriguing idea that part of knowledge of a subject is the ability to paraphrase and reword other people’s ideas. This author sees Aratus’ ability to convert Eudoxus’ works into verse as evidence for his astronomical skill, not against it.

The *vitae* offer intriguing hints about an ongoing debate concerning Aratus’ level of astronomical proficiency, into which they all eagerly insert themselves in different ways. Vita III suggests that this argument stretches back at least to Hipparchus, but his approach to Aratus is more complicated than the author of this biography credits. It is possible, of course, that this author had access to other works by Hipparchus that addressed this issue more carefully, but his commentary on the *Phaenomena* is surely the most directly relevant for this issue, and within it Hipparchus’ opinion of Aratus is somewhat occluded by his interest in contrasting his own work with that of the rival

commentator, Attalus of Rhodes.

Hipparchus' commentary, *pace* the author of Vita III, is not especially antagonistic to Aratus, but modern scholars have ascribed their own assumptions about Aratus to it. Most notably, Tueller and MacFarlane, in a recent attempt to parse Hipparchus' position on the subject, exaggerate Hipparchus' disdain for poetry with scientific subjects.<sup>135</sup> They base their opinion on Hipparchus' rationale that the reader should exercise caution in trusting Aratus, "for the charm of the poetry lends a certain trustworthiness to the things he says, and almost everyone who interprets this poet agrees with him."<sup>136</sup> The 'almost everyone' here probably refers to Attalus of Rhodes, whose commentary seems far less critical of the accuracy of the *Phaenomena*, in the quotations Hipparchus supplies.<sup>137</sup> Hipparchus' statement is more about distinguishing himself from his rival than about constructing a theory about the relationship between poetry and science. But it also suggests that readers felt that the work was worth reading *because* it was in verse, not in spite of that fact. This goes against the typical readings of Hipparchus' comment. He may be skeptical of Aratus' abilities, but not because he is a poet, and even this skepticism seems to be an outlying opinion. Hipparchus undoubtedly has a better understanding of the inaccuracies in the *Phaenomena* than most readers, given his diligent celestial observations, but his criticisms do not seem to have convinced later readers that Aratus was untrustworthy.

Moreover, although this comment suggests that he distrusted Aratus, Hipparchus'

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<sup>135</sup> Tueller and MacFarlane (2009), p. 237.

<sup>136</sup> Hipparch. I.1.7: "ἡ γὰρ τῶν ποιημάτων χάρις ἀξιοπιστίαν τινὰ τοῖς λεγομένοις περιτίθησι, καὶ πάντες σχεδὸν οἱ τὸν ποιητὴν τοῦτον ἐξηγούμενοι προστίθενται τοῖς ὑπ' αὐτοῦ λεγομένοις."

<sup>137</sup> Tueller and MacFarlane (2009), pp. 238-45. This may be an issue of selection bias, however, since Hipparchus is much more likely to quote Attalus in places where his contemporary has mistakenly accepted an error in Aratus' astronomy, than where they both have spotted the same blunder in the original poem.

approach is no different from his treatment of prose authors. He sees Aratus as entirely dependent upon Eudoxus, but this criticism is not dependent on the form of the work. Rather, he attributes Aratus' mistakes to an over-reliance on Eudoxus' ideas instead of personal observation.<sup>138</sup> Hipparchus makes clear that he does not value the authoritative weight of tradition and will discard it if it conflicts with his own observations, writing that his intention in this commentary is "to take notice of the things said by him [Aratus] about the heavens, and to record which things are consonant with the phenomena and which are not."<sup>139</sup> Attalus adopted a more conservative approach, weighing the authority of the *Phaenomena* equally with his own observations, and "having made each thing in accord with the phenomena and consistent with what the poet wrote."<sup>140</sup> In modern science, the idea of valuing an older text over one's own empirical data is inconceivable, and so Hipparchus' methodology seems far more sympathetic to modern scholars, including Tueller and MacFarlane, who liken him to a modern physicist debunking Star Trek.<sup>141</sup> Attalus' approach may be more representative of scientific practices in antiquity, however, and certainly parallels what Hipparchus accuses Aratus of doing with respect to Eudoxus. Hipparchus makes no distinction between the verse-composing Aratus and the prose-writing Attalus in his methodological expectations. They are neither as good at astronomy as he is himself.

Attalus' treatise occasionally seems to have made less distinction between poetic and scientific commentary, weighing in on textual issues and even occasionally offering

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<sup>138</sup> Hipparch. 1.1.8

<sup>139</sup> Hipparch. 1.1.4: "τὸ δὲ συνεῖναι τὰ λεγόμενα περὶ τῶν οὐρανίων ὑπ' αὐτοῦ, τίνα τε συμφώνως τοῖς φαινομένοις ἀναγράφεται καὶ τίνα διημαρτημένως."

<sup>140</sup> Hipparch. 1.3.3: "τοῖς τε φαινομένοις ἕκαστα σύμφωνα ποιήσαντες καὶ τοῖς ὑπὸ τοῦ ποιητοῦ γεγραμμένοις ἀκόλουθα."

<sup>141</sup> Tueller and Macarlane (2009), p. 235.

literary interpretations as well as factual information.<sup>142</sup> Hipparchus quotes these passages with contempt, and Tueller and MacFarlane therefore link Hipparchus' comparative disrespect of Aratus to the fact that he is a poet, writing that:

As we can see from the way Hipparchus characterizes Attalus' problems, proper performance of *scientific work* is being derailed by the expression of science in *poetic form*. This fact gives Hipparchus the foundation he will need...to create a new standard for scientific expression—a standard that will preclude the problems created by Aratus' poetry.<sup>143</sup>

This argument is complicated by the fact that Hipparchus' criticisms focus on Attalus' interest in such subject matter, rather than on Aratus. Hipparchus' interest in the *Phaenomena* lies in its astronomical content, and he never suggests that it is any less likely to be accurate than prose. And in fact, there are instances in which he states that Aratus was correct, and Attalus wrong.<sup>144</sup> Any poetic elements of the *Phaenomena* are simply irrelevant to Hipparchus' enterprise.

Most of the evidence of readers trusting Aratus comes from non-specialists, as the authors of the *vitae* presumably are. Geminus, however, the second century CE author who wrote an introductory 'textbook' to astronomy, the *Introduction to the Phenomena*, cites Aratus frequently.<sup>145</sup> His treatment of the *Phaenomena* betrays no doubt about the poet's competence, and he cites him as proof of, for example, the changing length of daylight and darkness over the course of a year.<sup>146</sup> Geminus, in an argument against the use of astronomical signs in weather prediction, cites Aratus:

Their risings and settings are cited for foreknowledge of the changes of the air, for

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<sup>142</sup> Possanza (2004), p. 91; Tueller and MacFarlane (2009), pp. 238-39.

<sup>143</sup> Tueller and MacFarlane (2009), p. 245, italics in the original.

<sup>144</sup> Hipparch. 1.3.9-10

<sup>145</sup> On Geminus, see Evans and Berggren (2006), pp.1-101.

<sup>146</sup> Gem.VII.12-13.

which reason they are not always in harmony [with the facts]. Thus one would better make use of the signs given us by nature, which, too, Aratus has used. For he omitted as mistaken the changes of the air [predicted] from the risings and settings of the stars, but inserted those arising naturally and from some cause in his treatise of the *Phenomena*, at the end of the whole work.<sup>147</sup>

Αἱ δὲ τούτων ἐπιτολαὶ καὶ δύσεις ἐπὶ τὴν ἐπίγνωσιν τῶν περὶ τὸν ἀέρα μεταβολῶν παράκεινται· δι' ἣν αἰτίαν οὐδὲ διὰ παντὸς συμφωνοῦσιν. Ὅθεν βελτίοσιν ἂν τις σημείοις χρήσαιτο τοῖς ὑπὸ τῆς φύσεως ἡμῖν διδόμενοις, οἷς καὶ Ἄρατος κέχρηται. Τὰς μὲν γὰρ ἐκ τῶν ἐπιτολῶν καὶ δύσεων τῶν ἄστρον γινομένας μεταβολὰς τοῦ ἀέρος ὡς διεγνευσμένας παρέλιπε, τὰς δὲ φυσικῶς γινομένας καὶ μετὰ τινος αἰτίας κατεχώρισεν ἐν τῇ τῶν Φαινομένων πραγματείᾳ ἐπὶ πᾶσι τῆς ὅλης συντάξεως.

The methodology that Geminus imputes to Aratus suggests that he treats it seriously as a scientific work, and show that it was not only lay people, but also writers focused on astronomy who found Aratus a trustworthy source for astronomical and meteorological information.

The question of Aratus' scientific competence is not an irrelevant one, and has existed since antiquity. The fact that such a debate existed suggests that some people in antiquity, even those who had read Hipparchus' commentary, such as the authors of the surviving *vitae*, felt Aratus' competence to be sufficient. Moreover, the types of criteria that have been used to assess the scientific quality of these works—the fact that they are poets, that they do not have professional status as scientists, that they used earlier prose works—are fundamentally flawed ways of evaluating the scientific value of these works.

So how does the scientific poet construct his authority? Authorial legitimacy in prose scientific texts is typically constructed by one's relationship to previous writers. This can be both adversarial, as writers attempt to distinguish their own work from others by showing how much better they are, and legitimizing, as writers authorize their own

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<sup>147</sup> Gem.XVII.45-47. Translation from Evans and Berggren (2006).

work by its connection to earlier treatises on the same subject.<sup>148</sup> Conversely, in epic poetry, the Muses are the traditional source of authority, most famously in Hesiod's discussion of sailing, which he claims he can only provide because of divine inspiration.<sup>149</sup>

Whereas Callimachus invokes the authority of the Muses throughout the first half of the *Aetia*, none of the poets under discussion in this dissertation include them in a particularly prominent way.<sup>150</sup> Aratus mentions them briefly at the end of his proem, asking, "And may the Muses rejoice, always propitious. If it is right that I pray for you to tell me of the stars (ἐμοί ... ἢ θέμις εὐχομένῳ), mark out (τεκμήρατε) my whole song."<sup>151</sup> He seems unsure if it is even appropriate for him to be asking them so much, and requests a rather hands-off role for them, merely offering signs for his song. At even further remove, Apollonius politely requests that they be the "interpreters" of his song.<sup>152</sup> Nicander does not mention them at all.<sup>153</sup> Both Aratus and Apollonius begin with prayers to the gods Zeus and Apollo respectively, which is surely a way of authorizing their poetry, but Nicander conspicuously omits any invocation of a deity at all at the

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<sup>148</sup> See Asper (2013), p. 422; Lloyd (1996b), pp. 20-46. Holmes (2013), p. 433, discusses the role of "assertive self-presentation" as another key component of 5<sup>th</sup> century scientific authority, interestingly, p.443, by connecting it to Odysseus telling his own story to the Phaeacians.

<sup>149</sup> See Rosen (1990); Fantuzzi and Hunter (2004), pp. 231-34.

<sup>150</sup> See Klooster (2011), pp. 209-12, on the changing role of the Muses in Hellenistic poetry.

<sup>151</sup> *Phaen.* 16-18: "Χαίρουτε δὲ Μοῦσαι, / μελίχθια μάλα πᾶσαι ἐμοί γε μὲν ἀστέρας εἰπεῖν / ἢ θέμις εὐχομένῳ τεκμήρατε πᾶσαν ἀοιδίην."

<sup>152</sup> A.R.1.22: Μοῦσαι δ' ὑποφήτορες εἶεν ἀοιδῆς. See Clauss (1993), pp. 17-20, on the ambiguity of this phrase and the relatively hands-off role of the Muses in both Apollonius and Aratus. Apollonius does address Erato at the beginning of 3.1, which has been seen as a signal of a shift in the poem for that book, see Campbell (1983), pp.1-7.

<sup>153</sup> Clauss (1993), p. 17, following Blumberg (1931), p.7, claims that with the exception of the *Ilias Parva*, "no ancient Greek epic began without mentioning or alluding to one or all of these goddesses." Given that context shows that Clauss is including Aratus' *Phaenomena* in the category of epic, Nicander should surely also qualify, but it seems that both Clauss and Blumberg have forgotten about him. See also Klooster (2011), pp. 209-12.

beginning of the *Theriaca*.<sup>154</sup>

All three poets open by connecting their work to archaic epic. Both Aratus and Apollonius do so by using the formulaic language of the Homeric Hymns and the proem of the *Works and Days*.<sup>155</sup> Both Apollonius and Nicander make explicit reference to earlier poetry: Nicander mentions Hesiod, and Apollonius states that, “earlier bards have sung of this ship.”<sup>156</sup> The literary source as a means of authority seems to become popular in the Hellenistic period.<sup>157</sup> Callimachus may rely on the imprimatur of the Muses in the *Aetia*, but he also asserted, “I sing of nothing without a witness.”<sup>158</sup> But this authority does not need to be exclusively poetic, for these authors. Lloyd has argued that the use of previous authors as sources of legitimacy rises among prose scientific works in the Hellenistic period as well.<sup>159</sup> There is some difference in the sources Aratus, Apollonius, and Nicander are citing, however, because those works in turn derive authority from the Muses. That is, these poets navigate between the two extreme poles of scientific and poetic traditions of authority.

This is also reflected in the ways that 3<sup>rd</sup> century poets discuss Aratus’ *Phaenomena*. As for the previous conversation about authority and competence, our evidence for Aratus is much better than for any other similar poet. Three surviving

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<sup>154</sup> The opening of the *Alexipharmaca* does connect Nicander to Apollo, which is a very good way of establishing authority for a poem about medicine. Clauss (2006) argues that Nicander puns on Rhea’s name in the opening word of the *Theriaca*, but by its very nature, this is not an explicit invocation.

<sup>155</sup> Clauss (1993), pp.15-16 on Apollonius’ opening and the Homeric Hymns. Kidd (1997), pp. 161-74, passim. offers specific echoes of Hesiod’s proems and the Homeric Hymns in Aratus’ proem.

<sup>156</sup> A.R1.18: “νήα μὲν οὖν οἱ πρόσθεν ἐπικλείουσιν ἄοιδοι.”

<sup>157</sup> On this, see Hunter (1995a) on Hesiod and Aratus, specifically; Fantuzzi and Hunter (2005), pp. 1-17, for a more general discussion.

<sup>158</sup> Pfeiffer fr. 612 : “ἀμάρτυρον οὐδὲν αἰίδω .” See Bing (1988), p. 36, on this line, and the question of whether the ‘witness’ is another text or a Muse.

<sup>159</sup> Lloyd (1996b), p. 24. See also Netz (2009), pp. 199-210, where he connects this ostentatious erudition in Hellenistic poets to practices of contemporary scientists.

Hellenistic epigrams mention him, two of which focus on the *Phaenomena*.<sup>160</sup>

Callimachus' epigram is the most famous, and especially so for its textual problems,

which bear upon the interpretation of the poem:

The song and the style are from Hesiod. Not the ultimate  
poet, I dare say, but the sweetest of verses  
has the man from Soli imitated. Hail, fine  
words, symbol of Aratus' sleepless nights.<sup>161</sup>

Ἡσιόδου τό τ' ἄεισμα καὶ ὁ τρόπος: οὐ τὸν ἀοιδῶν  
ἔσχατον, ἀλλ' ὀκνέω μὴ τὸ μελιχρότατον  
τῶν ἐπέων ὁ Σολεὺς ἀπεμάξατο: χαίρετε λεπταί  
ρήσιες, Ἀρήτου σύμβολον ἀγρυπνίης.

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<sup>160</sup> The third epigram is actually dedicated to "King Ptolemy," who Cameron (1995), p. 323, assumes is Ptolemy Philadelphus, but the final line describes Aratus as "λεπτολόγος," surely referencing the acrostic.

<sup>161</sup> AP.9.507 = Pfeiffer 27. My translation is adapted from Farrell (1991), pp. 44-45, and Gutzwiller (2007), p. 33, using the text from Pfeiffer (1953). There are two major textual problems in this poem. One concerns the final two words of the poem, which are "σύντονος ἀγρυπνίη" in the AP manuscript, but are quoted in Vita I as "σύγγονος ἀγρυπνίης." Recently, Stewart (2008) has argued that the final two words should be "σύντομος ἀγρυπνίη," which is much closer to the reading in the AP manuscript, and has precedent in the aesthetic terminology used by Callimachus. I have elected to keep Pfeiffer's text, because σύμβολον echoes the Aratean key-word σήμα, but Stewart's argument deserves consideration.

The second textual issue relates to the phrase "τὸν ἀοιδῶν/ἔσχατον" (1-2), which appears in the AP manuscript and in the Vita I quotation as "τὸν ἀοιδῶν/ἔσχατον." This textual problem has more bearing on the larger interpretation of the poem and especially the elliptic expression in lines 2-3. Farrell (1991) and Gutzwiller (2007), who adopt Pfeiffer's text, "τὸν ἀοιδῶν/ἔσχατον," read this to mean 'the ultimate poet,' namely Homer, and see the following line as a clarification of the difference between emulating Hesiod and Homer. Other scholars maintain that the manuscript's "τὸν ἀοιδῶν/ἔσχατον" is correct, and the bard in question is Hesiod (most notably Cameron (1972); (1995), pp. 374-79), but Gow and Page (1968), Asper (2004), pp. 488-89; Nisetich (2001); Stewart (2008) all use this reading). Thus, Stewart, following Nisetich, translates the phrase as 'to the last detail' (more literally, perhaps, 'not all of the poet'). The following lines then clarify how much of Hesiod's style Aratus employs, and Homer is not mentioned within the poem at all.

I find it much more plausible that Callimachus' poem is referring to the relationship Aratus' poem had with both Homer and Hesiod. Vitae I, II, and IV all claim that there was an ancient debate about whether Aratus was a ζηλωτής of Homer or Hesiod, and it seems most likely that this debate occasioned the epigram. First of all, the author of Vita I quotes this poem as evidence of his own belief that Aratus emulated Hesiod. Secondly, the Homeric echoes in Leonidas' epigram, discussed below are likely in response to Callimachus' claims here. Finally, Vita II quotes Boethus of Sidon, a late Hellenistic commentator on Aratus, claiming that the "πλάσμα" of the poem was Homeric. In Philodemus' *Volumina Rhetorica*, (164S), πλάσμα, as a part of a poem, is contrasted with both σχῆμα and τρόπος, Callimachus' term in this epigram. This makes it likely that Boethus of Sidon is using the term in direct response to Callimachus. All three of these writers, then, the author of Vita I, Leonidas of Tarentum, and Boethus of Sidon all read this poem as an argument within this particular debate about Aratean poetics. This is not conclusive, but there is little evidence to support the opposing idea, and so I have kept Pfeiffer's original text and followed the interpretation of the poem inherent within it.



The poem includes allusions to two flourishes in the *Phaenomena*, his famous acrostic of “λεπτή,” which Callimachus draws upon in 3, and a pun on his name, which may have inspired the word choice ‘ρήσιες’ in line 4.<sup>162</sup> Callimachus has a particular interest in the passages of the *Phaenomena* that correspond to his own aesthetic criteria, especially the importance of Hesiod and the Muses. Callimachus echoes Aratus’ salute to the Muses, “Χαίροιτε δὲ Μοῦσαι/ μελίχλαι μάλα πᾶσαι,” with “χαίρετε λεπταί/ ρήσιες,” and possibly puns on “μελίχλαι” with “μελιχρότατον.”<sup>163</sup> As mentioned earlier, this is the only reference to the Muses in the whole of the *Phaenomena*, and yet it colors Callimachus’ entire epigram. Callimachus is a careful enough reader of the poem to notice the acrostic that modern scholars overlooked until 1960, but he reads the poem mostly for how it relates to his own poetry.<sup>164</sup> Aratus may imitate Hesiod extensively in the *Phaenomena*, but, as I mentioned earlier, he has a fundamentally different relationship with the Muses. Intentionally or not, Callimachus calls attention to Aratus’ departure from his poetic predecessor.

A reader who knew the *Phaenomena* only from Callimachus’ epigram would have trouble identifying the subject of Aratus’ poem, but there are a few hints. The textually-problematic “σύμβολον,” if correct, recalls the main theme of the *Phaenomena*, the “σήμα” a word Aratus repeats throughout the poem, especially at programmatic points. Alan Cameron also interprets the use of “ρήσιες,” a word not usually applied to

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<sup>162</sup> Both Cameron (1995), pp. 321-33, and Stewart (2008) make this argument, claiming that the eta in ρήσιες is used to call attention to the ‘misspelling’ of Aratus’ name in the epigram (with an eta instead of an alpha in the second syllable).

<sup>163</sup> *Phaen.* 16-17; AP9.507.3-4;2.

<sup>164</sup> That is, the earliest published article Jacques (1960).

poetry, as a reference to the prose works of Eudoxus behind Aratus' lines.<sup>165</sup> Most pointedly, the final reference to "sleeplessness" is surely connected not only to his labor over the poetry, but also to the astronomical content of the poem, which can only be seen at night. The author of Vita III, defending Aratus from the charge of ignorance, cites the last line of this epigram: "ὁ Καλλίμαχος, συνεγγίζων αὐτῷ κατὰ τοὺς χρόνους [τοῦ] Ἀράτου σύγγονος ἀγρυπνίης, τῆς τῶν φαινομένων θεωρίας, διὰ τὴν παρατήρησιν."<sup>166</sup> To this particular reader, Aratus' practice of observational astronomy was evident, and he trusts Callimachus' opinion because of his chronological proximity. Modern scholars have been more skeptical; Asper writes, "Arat arbeitete nachts angespannt durch, vielleicht um die Sterne zu beobachten, wahrscheinlich am Schreibtisch."<sup>167</sup> Callimachus' poem, in typically elliptical epigrammatic fashion, highlights the key elements in the construction of Aratus' authority: his relationship to archaic poetry, the Muses, the role of Eudoxus, and Aratus' personal observations.

Leonidas of Tarentum also composed an epigram commenting on Aratus'

*Phaenomena*:

This is the work of knowledgeable Aratus, who once with refined  
 thinking pointed out the long-lived stars,  
 both the orderly and the wandering ones, in whose circles  
 the clear revolving sky is fixed.  
 Let him be praised, toiling at his great labor, as second to Zeus,  
 for he made the constellations brighter.

Γράμμα τόδ' Ἀρήτιοιο δαήμονος, ὅς ποτε λεπτῆ  
 φροντίδι δηναίους ἀστέρας ἐφράσατο,  
 ἀπλανέας τ' ἄμφω καὶ ἀλήμονας, οἷσιν ἐναργῆς

<sup>165</sup> Cameron (1995), p. 321.

<sup>166</sup> Vita III.17.29-18.4. See fn.161 on the discrepancy in the text of the final line of Callimachus' epigram.

<sup>167</sup> Asper (2004), p. 489.

ἰλλόμενος κύκλοις οὐρανὸς ἐνδέδεται.  
αἰνεῖσθω δὲ καμῶν ἔργον μέγα, καὶ Διὸς εἶναι  
δεύτερος, ὅστις ἔθηκ' ἄστρα φαεινότερα. (AP.9.25)

In contrast to Callimachus' epigram, Leonidas focuses mainly on the content of the poem, but he picks up on the same poetic markers of the *Phaenomena*, alluding to the acrostic with “λεπτῆ/ φροντίδι,” and also possibly pointing out the pun on Aratus' name in the proem with the phrase, “Διὸς εἶναι/ δεύτερος.”<sup>168</sup> It includes many specifically Homeric terms, such as “δαήμων,” “δηναίος,” and especially “ἔργον μέγα.” All of these call attention to the pervasive Homeric vocabulary in the *Phaenomena*.<sup>169</sup> Leonidas also includes “κύκλος” and “ἐναργής,” which are prominent terms in Homeric scholarship and may refer to Aratus' own scholarship on Homer.<sup>170</sup> Leonidas responds to Callimachus' straightforward declaration of the Hesiodic nature of the poem, with a more understated claim that it is really Homeric.

The most provocative Homeric term in the epigram, however, is “ἀλήμων,” which he uses to celebrate Aratus' clever explanation of the planets. This line has led some scholars to believe that either Leonidas had never read Aratus, or that he had done so very poorly, since Aratus very pointedly did not explain the planets.<sup>171</sup> This is an untenable claim. Aratus does not merely fail to mention them, but includes an elaborate praeteritio of the subject, in which he concludes, “I am still not brave enough for

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<sup>168</sup> Bing (1990), pp. 283-84. Aratus' name is the first word of the second line of the poem.

<sup>169</sup> On Aratus' use of Homeric language, see Kidd (1997), pp. 23-26.

<sup>170</sup> On enargeia as an important topic of discussion in Homeric scholarship, see Nünlist (2009), pp. 194-98. For the evidence that Aratus might have also work on the text of Homer, see Kidd (1997), p. 5; Martin (1998), pp. xii-xv.

<sup>171</sup> Waltz and Soury (1957), p. 11, makes this claim. See also Amerio (1981), who argues against such a reading of Leonidas' epigram.

them.”<sup>172</sup> Leonidas’ poem is full of very specific allusions to the *Phaenomena*, and it is therefore impossible to imagine he had not read the poem or missed this passage. Instead, the epigram is surely pointing directly to it. Leonidas mentions the fixed constellations, using the same word, “ἀπλανεῖς,” in the *sedes* as Aratus uses it in the *praeteritio*.<sup>173</sup> Moreover, “ἀλήμων” is not a term used to refer to the planets (other than here) until much later, but it has a strong Homeric pedigree as a word for wanderers, used especially of Odysseus.<sup>174</sup> Aratus also uses a non-technical term to refer to the planets in the *praeteritio*, “μετανάσται.”<sup>175</sup> The use of deliberately non-technical words and the pointed reference to Aratus’ inability to explain the planets call attention to the question of Aratus’ authority as an expert on astronomical matters.

It is possible that Leonidas found Aratus’ willingness to admit his own inabilities refreshing, in light of the posturing that is prevalent in both poetic claims of relationships with the Muses and scientific prose works where authors distinguish themselves from their predecessors.<sup>176</sup> The poem, read at face value, offers a straightforwardly positive comment on the *Phaenomena*, with only one minor problem: the reference to the planets. But it is also possible to read the poem ironically, and come to conclusion that Leonidas thinks very little of Aratus. Lending some support to the latter argument is another of his epigrams, immediately preceding this one in the AP, in which he recounts how Homer blotted out the light of the stars and the moon with the bright beauty of his poetry.<sup>177</sup>

This casts Leonidas’ final line, that Aratus made the stars “φαεινότερα,” in a more

<sup>172</sup> *Phaen.*460: “οὐδ’ ἔτι θαρσαλέος κείνων ἐγώ.”

<sup>173</sup> *Phaen.*461.

<sup>174</sup> LSJ s.v.

<sup>175</sup> *Phaen.*457.

<sup>176</sup> See Lloyd (1987), pp. 56-70; Holmes (2013) on egotism in scientific writing.

<sup>177</sup> AP.9.24.

negative light. The problem can be boiled down to the translation of the phrase “λεπτῆ/φροντίδι,” Leonidas’ response to Aratus’ acrostic. Does Aratus use subtle, refined thinking to teach us, or, using the older, less Callimachean meaning of the word, does he use feeble, weak thinking?<sup>178</sup>

It is most likely that Leonidas intends to prompt these questions, but not to answer them. His term for the planets, “ἀλήμονες,” the only place where the straightforward reading of the epigram becomes problematic, does appear in the *Phaenomena*, but not in the planetary praeteritio. Instead, it comes in a passage near the end of the poem, where Aratus explains how one meteorological sign means good news for the goatherd, but bad news for the farmer: “This is the way we men live, toiling and wandering (ἀλήμονες) in all different ways; we are all quickly ready to recognize signs and to accept them right away.”<sup>179</sup> Just as the farmer and the goatherd, looking at the same flock of bird, Callimachus and Leonidas read the same poem, and interpret it in diametrically different ways. Leonidas wants the reader to understand the ambiguity in his own poem, and in the *Phaenomena*. But both poets highlight the question of Aratus’ authority, and, in both of them, his relationship to earlier epic is an essential part of the conversation.

It is not irrelevant to question how these poets constructed their authority and whether they knew what they were talking about. But the claims that have been made about their competence are based on modern ways of establishing scientific qualifications. We cannot base our understanding of the proficiency of these poets on ancient discussion, not only because it is a problematic methodology, but also because

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<sup>178</sup> See Cameron (1995), p. 323, on the gradual change in meaning of the word.

<sup>179</sup> *Phaen.* 1101-03: “Οὕτω γὰρ μογεροὶ καὶ ἀλήμονες ἄλλοθεν ἄλλοι/ζώομεν ἄνθρωποι· τὰ δὲ πᾶρ ποσὶ πάντες ἐτοιμοὶ/σήματ’ ἐπιγνῶναι καὶ ἐς αὐτίκα ποιήσασθα.”

the evidence does not survive for Apollonius or Nicander, and the evidence for Aratus reveals a complicated debate about this very issue. But the terms on which this debate occurred do not correspond to our own. In particular, Aratus' relationship to earlier works, both poetic and astronomical, is not cast as a demonstration of lack of competence, but rather of his skill and authority.

There is one other way that authority is constructed by these poets, and that is connected to their emphasis on empiricism and signs. Signs offer a demonstrable, visible proof, external to the text, that can authenticate the information the poets provide. These signs, as will be explored in the chapters, are not inherently true, by any means. Apollonius in particular cites signs in faraway places, that most of his readers would not be able to reach. Nicander even stresses the difficulty of distinguishing the signs of different kinds of venoms. Aratus discusses the triple blooming of the mastich tree as a sign, even though the tree only flowers once a year. But even so, by claiming that the reader can look at the evidence for herself, the poet gains greater authority for his statements.

## **V. Dissertation Overview**

Asper opens his article about Callimachus' use of scientific ideas by stating that, "third century Alexandria saw not only the emergence of new styles of art and poetry but also major innovations and achievements in both pure and applied science."<sup>180</sup> The idea of the Hellenistic period as a distinct era has recently come into question, however, with respect

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<sup>180</sup> Asper (2009), p.1

to the developments in poetry and to the political changes after Alexander.<sup>181</sup> In the sciences, the importance of Aristotle for the work done in the 3<sup>rd</sup> century has long been realized.<sup>182</sup> Asper's statement still remains true, however, and even the greater emphasis on continuity with the past does not belie the exciting changes taking place in the third century. In some ways, my time frame has been chosen for me by the surviving evidence, but that does not make it arbitrary. The creation of institutions in which poets and scientists were both essential participants, such as the Mouseion at Alexandria, created a culture that fostered cross-pollination. In the ordering of my chapters, I have followed the chronology of the poets, and I have avoided the temptation to overlay a strong narrative onto the dissertation, but both Apollonius and Nicander are clearly influenced, in their own ways, by Aratus.<sup>183</sup> There are quite important differences between each of these poets, and their different subjects, generic aims, and even geographical (and chronological) locations contribute to make their work very dissimilar in some ways. Nevertheless, they do belong in the same conversation, and I will draw connections between their works.

In my first chapter, I consider the *Phaenomena* as an important breakthrough in scientific poetry. I first show the interrelation of Aratus' poetry and the subject matter, and that his interest in signs permeates every aspect of the poem. Aratus has a coherent theory of signs, one that can be situated within contemporary intellectual currents and that extends to his own metapoetics. Signs in poetry allow him to discuss the

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<sup>181</sup> On the subject of poetry, and continuity in the Hellenistic period with what came before, Acosta-Hughes (2010). As for political continuity, see Shipley (2000), pp.1-3.

<sup>182</sup> See Lloyd (1973).

<sup>183</sup> The dating of each of these poets will be discussed in their respective chapters, but I have not strayed from the standard chronology.

accessibility of his work and its value as a teaching text. The success of Aratus' poem then creates a framework for scientific poetry that the later poems connect themselves to and deviate from.

I next explore Apollonius' position within third century geographical debates. I argue that the nature of geography as a discipline is a problem throughout the Hellenistic period, and that Apollonius and Eratosthenes are, in their own ways, attempting to define it. At stake in this discussion is the role of poetry within the discipline, and especially of Homer. Apollonius' *Argonautica* offers a picture of the *oikoumene* that is carefully constructed and consistent with both current knowledge and Homeric precedent, providing an argument that Homer and poetry have a place in geographical discourse. In it, he uses the signs left by the experiences of the Argonauts to show his own authority on the subject, and the role of archaic poetry in the study of geography.

I conclude with the two surviving poems of Nicander, the *Theriaca* and the *Alexipharmaca*. Whereas sufficient other works survive to discuss the previous two poets within the context of their respective disciplines, Nicander is our only window onto the state of medicine in the late Hellenistic period, and he is the earliest source of toxicological information at all. Nicander's relationship to the study of toxicology at the time can only be seen in glimpses, but his relationship to earlier Hellenistic poetry is much clearer. In this chapter I consider how Nicander connects his own poetry to Aratus through the use of signs, explores the ambiguity of biological diversity, and ultimately shows the life-saving power of scientific poetry.



These are three different poets, operating in different fields of science, and writing with different generic aims. Apollonius' difference from Aratus and Nicander is clearest, but Aratus and Nicander, although composing in the same genre, do not share the same goals. Aratus sincerely desires to teach something he thinks can be understood with some certainty, whereas Nicander explores ambiguity and uncertainty. Nevertheless, there are important themes that run through all of these texts. The first is the commitment to the role of poetry in the transmission of knowledge and the authority inherent in archaic epic. All three of these poets create a strong connection between their own compositions and Hesiod and Homer. The role that archaic poetry played in the gathering of information in the Hellenistic Period, shaped by the scholarship on those works, is essential to the presentation of scientific information within these works. Second is their complicated relationship with their prose sources. Each author interacts with prose authors differently, offering alternative models of how authority can be transferred between prose and verse. Thirdly, there is a strong emphasis on the organization of content as an important step in understanding it. Each poet finds a different answer to the question of how one systematizes a large and unwieldy body of information, but it is a central focus for each of the poems under consideration in this dissertation. Finally, and most importantly, is the thread of signs that runs from poet to poet. Aratus' theory of signs is the most developed and it is a central feature of his work, but signs recur in the work of Apollonius and Nicander, as well. Their signs represent a connection of their own work to the *Phaenomena*, and a proof of their truth-value that is based on empiricism. Signs are the unifying feature of Hellenistic scientific poetry.

# CHAPTER 1: ARATUS, THE POET OF SIGNS

## I. Introduction

Scholars often include, when discussing of Aratus' *Phaenomena*, some admission of the fact that many modern readers do not enjoy the poem.<sup>184</sup> The blame is usually given to the poem's subject matter, the catalog of stars and weather signs, and this has resulted in a strangely dichotomous development of the scholarship about the poem. As mentioned in the introduction, scholars of Hellenistic poetry avoid the scientific material completely, focusing instead on formal aspects and literary influence.<sup>185</sup> Historians of ancient science tend to discount Aratus altogether, claiming that he has no place in their studies.<sup>186</sup> An

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<sup>184</sup> This is most evident in handbook and general works on Hellenistic poetry. See, for example, Hutchinson (1988), p. 215; Volk (2012), p. 197; Lehoux (2007), p. 7; Hopkinson (1988), p.138; Zanker (1987), p. 97, and especially Gutzwiller (2007), p. 98: "the central interpretive problem in scholarship on Aratus has always been to reconcile his enormous ancient popularity with the modern reaction, which is often tedium." Earlier scholars were more willing to admit their own personal distaste for the poem. Knaack (1895), p. 398, rather notoriously called the poem "trocken und einförmig," not needing to focalize his criticisms from the perspective of another reader.

<sup>185</sup> Most notably, Hunter (1995a), Fantuzzi and Hunter (2004), pp. 224-245, and Fakas (2001) on Aratus' connections to Hesiod and other Hellenistic Poets; On formal aspects of the poem, see Jacques (1960), Vogt (1967); Pendergraft (1996); Haslam (1992); Bing (1990); Bing (1993), almost all of which concern the possible existence of acrostics within the poem. Porter (1946) addresses both, demonstrating metrical similarities with Hesiod. Erren (1967) is the exception to this, focusing primarily on the philosophical aspects of the poem.

<sup>186</sup> Otto Neugebauer, the elder statesmen of the history of ancient astronomy, almost certainly does not consider Aratus an astronomer, mentioning him almost only in the context of Hipparchus' commentary on his poem, e.g. Neugebauer (1975) p.274; 301; 581 and Neugebauer(1957), p. 69; 185-86. For example, in a lengthy explanation of stellar coordinates, Neugebauer (1975), p. 278, describes, "how far from exact mathematical definitions the astronomers were shortly before and still at [Hipparchus'] time (he mentions explicitly Eudoxus and Attalus)." That is, Aratus does not merit inclusion in Neugebauer's list of astronomers cited in Hipparchus, even in the context of lack of quantitative precision. Occasionally, his unwillingness to consider Aratus a viable source of information reduces the amount of evidence he has. Neugebauer (1975), p. 301, laments that Hipparchus "is the almost only source from which one can hope to obtain information about the terminology at his time and before," about stellar magnitudes, when in fact, Aratus discusses the relative brightness of stars quite frequently. Historians of meteorology have been somewhat more willing to use the poem, see for example Taub (2003), pp. 46-54, which considers the audience such a work would have. Lehoux (2007), who does occasionally use information from the poem and makes no distinction in the terminology he uses for it and other written *paraepgmata* (all of which he terms 'literary,' as opposed to 'inscriptional,' see p. 23). However, as is clear in his section II.ii. 'Who wrote *paraepgmata*?', pp. 20-22, Lehoux still maintains a fundamental distinction between Aratus, as the author of the extant text, and the creators of the original *paraepgmata* that Aratus used, who were, p. 21, 'a

implicit divide has arisen, implying that the poem and its content are somehow separate entities that can be studied and understood independently of each other.<sup>187</sup>

I will argue for an integrated interpretation to the poem, in which Aratus' scientific and poetic interests mutually inform one another. Although often characterized as an astronomical poem (with a meteorological addendum), I will show that the *Phaenomena* is more accurately a poem about signs in the universe and how we humans decipher them. Signs in the *Phaenomena* operate in the actual phenomena described, in the mythological narratives of catasterisms, and in the specific words Aratus chooses to use. In this chapter, I first demonstrate that Aratus establishes the interrelation between the form and the content of his work, both on the microscopic level of individual lines and passages, and the macroscopic level of larger patterns in the world and the poem. I then explore how Aratus conceives of the process of understanding signs, and how this relates to his scholarly, philosophical, and poetic interests in ways that reflect back upon the educational purpose of the poem.

As discussed in the introduction, scholars often point to Aratus' use of the astronomical treatises of Eudoxus as a justification for ignoring it in analyzing the

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veritable *Who's Who* of early Greek astronomy,' a list that includes Eudoxus and Hipparchus. He also includes a list, p. 20, of "literary parapegmata whose authors we know," which includes Ovid, but not Aratus. Dicks (1970), pp. 153-63, reconstructs Eudoxus' astronomical works entirely from Aratus and Hipparchus' comments on the poem, citing Hipparchus as justification for considering Aratus' *Phaenomena*, p. 158, "to a large extent...a paraphrase of Eudoxus." See also Evans (1998), pp.40-42; 75-76. Lloyd (1970), p. 97, a smaller scale example of this kind of *Quellenforschung*, and Lasserre (1966).<sup>187</sup> Hopkinson (1988), p. 138, even states as much: "Ancient readers enjoyed and appreciated for their own sake formal aspects of the art of poetry—elegant versification, elegant expression, elegant solutions to difficult problems of presentation," suggesting that the actual content of the poem was largely irrelevant to their enjoyment.

poem.<sup>188</sup> Although Aratus was dependent on Eudoxus, his use and presentation of the material must be understood as fundamentally his own.<sup>189</sup> There are discrepancies between the *Phaenomena* and Eudoxus' writings, some of which probably arose from personal observations by the poet.<sup>190</sup> In addition, Aratus organizes the information differently from Eudoxus, and he focuses on the brightness and visibility of the constellations, details that Eudoxus mostly omits.<sup>191</sup> Moreover, Hipparchus only claims that Aratus used Eudoxus' works for the astronomical portions of the poem. The source of Aratus' meteorological information cannot be definitively identified, and an important theme of the *Phaenomena* is the connection between the signs in the constellations and the signs of impending weather.<sup>192</sup> All of these differences highlight Aratus' true interest in the *Phaenomena*, the signs that emerge in the patterns in the universe and our ability to understand them. This chapter will explore how Aratus conceives of signs and patterns

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<sup>188</sup> The last third of the poem (733-1154) switches from astronomical signs to meteorological signs and scholars have much more doubt about the source of the information presented in this section. A surviving text called *De Signis* clearly has some relationship to the poem, as almost all the same signs are contained in both, in roughly the same order. However, the relative chronology of the two works is uncertain. Sider (2007), pp. 40-43, offers a thorough overview of the possible candidates, and argues for an original text composed by Aristotle and then adapted separately by both Eudoxus and Theophrastus, the former being the source text for Aratus, and the latter being transmitted, heavily redacted, as the surviving *De Signis*. Cronin (1992) and Taub (2003), p.27, also argue for a Peripatetic authorship, though not necessarily Aristotle or Theophrastus. LeHoux (2007), p.5, accepts Theophrastus as the mostly likely candidate. Cusset (2011a) thinks the surviving prose text was written by Aristotle himself.

<sup>189</sup> Martin (1998), p.lxxxviii, citing similar sentiments in Kaibel (1894), makes this point, writing, "s'il a utilisé de même, pour la partie astronomique, un traité en prose, d'Eudoxe ou d'un autre astronome, il en a retravaillé les éléments pour en faire les matériaux d'une construction tout à fait originale." The fact that this statement needed restatement a century later, and is still not adopted by most scholars, speaks to the problem.

<sup>190</sup> Kidd (1997), pp. 16-17, provides a list of places in the text where Aratus is known to have diverged from Eudoxus, and he feels may be corrections of the older text. Kidd is, in general much more willing than most scholars to give Aratus a certain autonomy, attributing the general disdain for Aratus' astronomical abilities to prejudice in Hipparchus. See Evans (1998), pp. 75-76, for the prevailing scholarly view of Eudoxus' influence on Aratus.

<sup>191</sup> See Pendergraft (1982).

<sup>192</sup> A prose text entitled *De Signis* survives that clearly bears some relationship to the *Phaenomena*, although it is generally believed to postdate the poem in its current state. See Kidd (1997), pp. 21-23, and fn.188 above.

in the world and in his poetry, themes that are not present in the surviving fragments of Eudoxus.

An offhand comment by Aristotle about poetry has also cast a shadow over Aratean scholarship. He famously declared that, “Homer and Empedocles have nothing in common except meter, for which reason it is right to call the one a poet and the other a natural philosopher (φυσιολόγον) rather than a poet.”<sup>193</sup> This sentence, on which he does not elaborate, suggests that Aristotle used not only meter, but also subject matter as a criterion for defining poetry. It is tempting to see Aratus’ *Phaenomena* as a direct challenge to Aristotle’s claim, and Fakas reads the poem this way, calling it, “das eindrucksvollste Beispiel von Aristoteles-Rezeption in der hellenistischen Poesie.”<sup>194</sup> Aratus blurs the categories that Aristotle neatly delineated, appropriating from Homer and Empedocles, as well as Hesiod, whom Aristotle does not mention.<sup>195</sup> And yet, Aristotle’s claim that scientific works in verse are not poetry has loomed large in Aratean scholarship, as scholars have frequently debated whether we should classify Aratus as a ποιητής or a φυσιόλογος, without questioning whether we need to consider them as fundamentally discrete options.<sup>196</sup> Aratus’ *Phaenomena* offers the best refutation of such a claim: a work in which scientific content and poetic form are perfectly harmonious.

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<sup>193</sup> Arist.*Poet.*1447b: “οὐδὲν δὲ κοινόν ἐστιν Ὅμηρῳ καὶ Ἐμπεδοκλεῖ πλὴν τὸ μέτρον, διὸ τὸν μὲν ποιητὴν δίκαιον καλεῖν, τὸν δὲ φυσιολόγον μᾶλλον ἢ ποιητὴν.”

<sup>194</sup> Fakas (2001) p. 483. His argument focuses on Aratus’ use of mythological associations, particularly in the Cepheus family, to incorporate narrative elements into the genre, assuming that Aristotle thinks diegetic/non-diegetic to be the essential contrast between Homer and Empedocles.

<sup>195</sup> Aratus’ appropriations from Homer and Hesiod have been well documented: Fakas (2001) offers the most thorough accounting of Aratus’ borrowing from Hesiod, and Kidd (1997), pp. 23-25, gives a good overview of the Homeric elements of the poem. Scholars are only beginning to address the role Empedocles plays in the *Phaenomena*: Gee (2013), pp. 29-32, is a good start.

<sup>196</sup> Cusset (2011b) is perhaps the most straightforward approach to this question, but it comes up in almost all scholarship on the *Phaenomena*. See, for example, Fantuzzi and Hunter (2004), p.224; Tueller and MacFarlane (2009), pp. 235-37.

## II. Ornamentation and Information

Aratus does not offer an explicit explanation of the relationship between form and content in his poem, but the *Phaenomena* contains a wide variety of experimentation with ways of using meter and language to converse with the astronomical ideas expressed within these lines. This first section of the chapter demonstrates a few of the ways that formal aspects of the poem, deriving from meter and especially poetic devices, have direct bearing on the scientific content, and are therefore not merely artistic embellishments, but fundamental and essential to the meaning of the poem.

Aratus exploits the flexibility of language to demonstrate the range of the key thematic word of the entire poem, σῆμα. Signs are the main theme of the poem, and so, unsurprisingly, the word and its cognates occur 57 times, including three times in the opening “Hymn to Zeus” and three times again in the epilogue.<sup>197</sup> Most of the iterations of the word are straightforwardly semiological. The constellations often provide signs of the passage of time, or prompts for particular seasonal activities. The poem makes this clear, when the poet declares that the stars “σημαίνοιεν/ ἀνδράσιν ὥράων.”<sup>198</sup> In other contexts, the stars give σήματα for other constellations that are too faint to discern or are otherwise obscured, such as Ophiuchus, which is a “σῆμα” for the rising of the Twins.<sup>199</sup> And the most common usage of the word is for meteorological signs, such as how a

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<sup>197</sup> On the importance of signs to the poem, see Volk (2010); Benatouïl (2005).

<sup>198</sup> *Phaen.* 12-13.

<sup>199</sup> *Phaen.* 725.

swelling sea is a σῆμα of impending wind.<sup>200</sup> These repeated usages demonstrate the omnipresence of signs both throughout the universe and the poem.

These relatively uncomplicated usages of the word also prime the reader for the occasional places where the poet uses the word in unexpected contexts. These mostly come later in the poem, so that the repeated usage of the word has become unsurprising and routine, and thus the novel usage plays with the reader's expectations. The most confusing comes in the description of the relative value of weather signs on the sun:

Take care to note the sun's movement on both sides: quite trustworthy signs (σήματα) reside in the sun both setting and rising from the horizon. May the circle not be spotted when it first hits the earth, when you need a balmy day, and may it not carry any mark (μηδέ τι σῆμα φέροι), but rather shine entirely unblemished.

Ἡελίοιο δέ τοι μελέτω ἐκάτερθεν ἰόντος·  
ἠελίῳ καὶ μᾶλλον ἐοικότα σήματα κεῖται  
ἀμφοτέρων δύνοντι καὶ ἐκ περάτης ἀνιόντι.  
Μή οἱ ποικίλλοιτο νέον βάλλοντος ἀρούρας  
κύκλος, ὄτ' εὐδίου κεχρημένος ἡματος εἴης,  
μηδέ τι σῆμα φέροι, φαίνοιτο δὲ λιτὸς ἀπάντη. (*Phaen.* 819-824)

The earlier, more straightforward usage of the word in line 820 draws attention to the second instance in line 824, which creates a linguistic paradox. The final clause of the line clarifies that Aratus is not simply stating that the lack of any sign for bad weather means the weather will be good, but rather, the pure whiteness of the sun, the lack of any mark on it, is itself a sign of good weather.<sup>201</sup> That is, the absence of any σῆμα is a σῆμα itself. This pun, a not uncommon phenomenon with in the *Phaenomena* as a whole, is underscored by the almost-σῆμα hidden in the phrase “κεχρημένος ἡματος.” (823)<sup>202</sup>

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<sup>200</sup> *Phaen.* 909.

<sup>201</sup> Kidd (1997), p. 460.

<sup>202</sup> I am indebted to Joseph Farrell for pointing out this hidden 'sign.'

Aratus stretches the meaning of the central thematic word of the poem, highlighting the wider range it can have.

Similarly, a lamp provides a sign of snow when, “marks (σήματ’) similar to millet surround a lamp-wick bright with fire.”<sup>203</sup> Here the pun works in two ways. First, it reinforces the joke in the previous example on the use of σῆμα to simply mean a mark. However, it also comes just after a rather dizzying collection of weather signs, abruptly cut off by the rhetorical question, “Why do I tell you all the signs (σήματ’) that exist for men?”<sup>204</sup> The image of dark “σήματα” crowding out the light of the lamp suggests our narrator is beginning to feel overwhelmed at the quantity of weather signs he could include in the work. Not only are the “σήματα” in the wick a σῆμα of rain, but also of the meteorological σήματα collectively.

These examples come late in the poem and thus play on the repeated use of the word. One particularly distant meaning, however, comes early in the poem, in the description of “that Crown, the brilliant marker (σήμα) Dionysus set up for departed Ariadne.”<sup>205</sup> Although it can be interpreted simply as a sign of her existence, it clearly evokes the common usage of σῆμα to represent a burial monument.<sup>206</sup> Volk has drawn connections between the use of the word here and the play on tangibility also present in

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<sup>203</sup> *Phaen.*1039-40: “κέγχροις ὄτ’ εἰκότα πάντη/ κύκλω σήματ’ ἔχει πυριλαμπέος ἐγγύθι μύξης.”

<sup>204</sup> *Phaen.*1036-37: “Τί τοι λέγω ὅσσα πέλονται/ σήματ’ ἐπ’ ἀνθρώπους;”

<sup>205</sup> *Phaen.*71-71: “κάκεινος Στέφανος, τὸν ἀγαυὸν ἔθηγεν/ σῆμ’ ἔμεναι Διόνυσος ἀποικομένης Ἀριάδνης.”

<sup>206</sup> LSJ *s.v.* “σήμα” A.3. Ariadne’s death has elicited some attention from scholars who read it as a marked departure from Hesiod (who made her immortal), see especially Fakas (2001), pp. 180-81. Erren (1967), p.34, saw her death as a necessity to create a complete rift between pre-catasterism mythological past and the present, in which the constellations are permanent, but explained the discrepancy with Hesiod’s version by arguing that Zeus makes Ariadne immortal by putting her crown in the sky.



Hellenistic epigram.<sup>207</sup> However, this is the first usage of the word σῆμα after the prologue, which established its importance as a thematic word, and it has only a tenuous connection to the main themes of the poem. Instead, it shows the linguistic dexterity of the word, and how Aratus' poem about σήματα can incorporate all aspects of them, even those quite remote from his area of interest. The use encourages the reader to think about the links between the various definitions of the word, and to find the patterns that link them. A constellation σῆμα can also be a burial σῆμα, and the tie that binds the two together is the word itself. This instance of the word, like the previous two, draws attention to the multiple meanings of the word outside of a purely semiotic context.

Aratus uses the name Zeus to draw connections between language and natural phenomena. In the early sections of the poem, Aratus frequently refers to Zeus as a deity within mythological accounts, such as descriptions of the Cretan Bears or the Olenian Goat. In the meteorological section, Zeus the deity becomes increasingly confused with Zeus as a metonym for the sky, such as when a sailor in a storm fears “μή μιν τῆ μὲν ἔχῃ πέλαγος, τῆ δ' ἐκ Διὸς ὕδωρ.”<sup>208</sup> “Διὸς” here means “sky,” as Aratus paints a picture of a man surrounded by water both above and below, but it also recalls the opening invocation of Zeus, blurring the line between god and sky, and giving both the locative and causative origins of the rain in one word. This conflation is compounded by the abundance of words referring to the weather that contain Zeus' name within them, further stretching the god's name. This emerges clearly in the description of how one should expect a storm if

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<sup>207</sup> Volk (2012), pp. 222-223.

<sup>208</sup> *Phaen.*936. Kidd (1997), p. 496, feels that this use of Zeus as metonymy is “contrived,” since the lightning would be the greater danger than the rain.

the Manger constellation disappears while “πάντη Διὸς εὐδιόωντος.”<sup>209</sup> By placing the two words together, Aratus calls attention to the wordplay, and the diverse meanings of the god’s name.

Christos Fakas has interpreted this use of Zeus’ name as evidence of Aratus’ lack of piety, as a way of mocking Zeus by phasing him out of his own poem and replacing him with low puns on base material.<sup>210</sup> But there is no evidence in the poem that Aratus regards this subject as inferior, and in fact, scenes like that of the sailor in the storm, cited above, convey great awe and respect for the power of weather systems. The poem begins with a celebration of Zeus’ ubiquity, which Manfred Erren has interpreted to refer specifically to human communication and interaction.<sup>211</sup> A far easier interpretation of these puns therefore is simply a manifestation of Zeus’ omnipresence both in human language and in the natural world. The poet has moved past telling the reader about Zeus’ centrality and instead has begun demonstrating it. The connection between the mythological infant Zeus, hiding in Crete protected by bears, and the stars and the weather resides in his very name.

One of the most famous elements of Aratus’ poem is the acrostic of the word “λεπτή.”<sup>212</sup> It is probably the earliest extant intentional acrostic, and it clearly made an

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<sup>209</sup> *Phaen.* 899.

<sup>210</sup> Fakas (2001), pp. 216-17. See further discussion of this argument on pp. 88-92.

<sup>211</sup> Erren (1967), pp. 19-20

<sup>212</sup> *Phaen.* 783-87. The acrostic was first discovered in modern times by Jacques (1960), see also Vogt (1967) and Kidd (1997), pp. 36-37; 445-46. Many scholars have argued for other similar poetic devices elsewhere in the poem, but these have not been universally accepted. See especially Bing (1993) and Haslam (1992), who focus on an acrostic of “πᾶσα” (802-06) and “μέση” (807-08). Kidd (1997), p. 446, is “not convinced these are intentional and significant,” a sentiment also expressed by Cameron (1995), pp. 37-38. See also Danielewicz (2005); Cusset (2002); Fakas (1999); Cusset (1995); Levitan (1979).

impression on many ancient readers.<sup>213</sup> The epigrams about the poem mention it, and it was imitated by Nicander and Vergil.<sup>214</sup> The acrostic has a larger significance, however, for the relationship between the literary aspects of the *Phaenomena* and its scientific content. As Hunter has discussed, the acrostic comes in the midst of a description of weather signs from the moon, but is closely preceded by a passage of larger thematic importance.<sup>215</sup>

For we humans do not yet recognize everything from Zeus, but many things still lie hidden, which Zeus will quickly show if he wishes. Indeed, he aids mankind manifestly, visible from everywhere, and revealing signs in every way.

πάντα γὰρ οὔπω  
 ἐκ Διὸς ἄνθρωποι γινώσκομεν, ἀλλ' ἔτι πολλὰ  
 κέκρυπται, τῶν αἴ κε θέλη καὶ ἐσαυτικά δώσει  
 Ζεὺς· ὁ γὰρ οὖν γενεὴν ἀνδρῶν ἀναφανδὸν ὀφέλλει  
 πάντοθεν εἰδόμενος, πάντη δ' ὅ γε σήματα φαίνων. (*Phaen.*768-72)

The proximity of this passage, the so-called “Second Proem,” to the acrostic, ten lines later, suggests that the two are connected, offering the most explicit connection between Aratus’ scientific lessons and his poetic experimentation. The hidden word offers the reader an object lesson in recognizing signs even when they are not immediately obvious. Many scholars have read a metapoetic significance in the word “λεπτή,” based on Callimachus’ use of it, but that valence is hardly secure.<sup>216</sup> As Hunter writes, “Even if we wish to deny that Aratus’ choice of language carries a programmatic charge in the

<sup>213</sup> The acrostic of ‘λεῦκη’ in *Il.*24.1-5 is almost certainly accidental, but Aratus and others probably did not believe that to be the case, as discussed in the Introduction. See Korenjak (2009).

<sup>214</sup> Cameron (1995), pp. 321-28; Bing (1993), pp. 107-08; Danielewicz (2005), p. 324.

<sup>215</sup> Hunter (1995a), section 2. See also Haslam (1992).

<sup>216</sup> Cameron (1995), pp. 324-26, argues that in fact, λεπτότης was a metapoetic word for Aratus and *not* for Callimachus, but his argument has not been widely accepted among other scholars. Bing (1993); Kidd (1997), p. 446; Klooster (2011), pp. 154-61, are all fairly certain of a Callimachean allusion in Aratus’ decision to use the word, citing the use of “καθαρή,” another Callimachean term, in the same line. Hutchinson (1988), p.215, n.4, and Hunter (1995a) are far more skeptical.

context of contemporary poetry, — and both chronology and a dearth of other comparative evidence make the matter at best uncertain — the acrostic shows us how the pattern of the universe is reflected in the pattern of the poem. The stars are literally in the poem, and vice versa.”<sup>217</sup> Even without a Callimachean connotation, “λεπτή” still has poetic significance, imitating the acrostic of “λεύκη” in the *Iliad*.<sup>218</sup> The word “λεπτή” is not chosen merely for its echo of the Homeric acrostic, however, but is also perfectly germane to the particular passage, referring to the phase of the moon when it provides the described signs. One word simultaneously alludes to an important poetic inspiration, demonstrates part of Aratus’ semiological theory, and provides specific meteorological information. The acrostic shows how the poem blurs the boundaries between the phenomena that it describes and the language that it uses to do so. It provides the most concrete, but not the only example of how Aratus ties his poetry and the stars (and other signs) together.

The shape of the poetry often mirrors the phenomena it describes. In a similar fashion, when describing how the days of the month correspond to the phases of the moon, Aratus writes, “ὀκτὼ δ’ ἐν διχάσιν, διχόμενα δὲ παντὶ προσώπῳ.”<sup>219</sup> Aratus describes different types of halvings, while incorporating a third; the caesura creates a divide between the half-lines describing the half-visible moon (at the quarters of the months) and the halved month (with a full moon).<sup>220</sup> In a similar fashion, the λεπτή

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<sup>217</sup> Hunter (1995a), section 2.

<sup>218</sup> Hom.*Il.*24.1-5. Korenjak (2009). See also Stewart (2008), pp. 592-93. As Kidd (1997), p. 446, points out, Aratus also uses “λεπτή” to imitate Homer’s “λεύκη” (*Od.*6.45) in *Phaen.*80.

<sup>219</sup> *Phaen.*737.

<sup>220</sup> See Kidd (1997), p. 427-28, on the awkward phrasing Aratus uses here, placing greater emphasis on the wordplay than an exact representation of the phases of the moon.

acrostic makes the letters on the page mirror the long, thin, attenuated shape of the moon he is describing.

Aratus also replicates the arrangement of the stars within the constellation Sirius in the lines of his poetry:

Similarly, below [Orion's] raised back also shines his guard, the dog (Κύων), standing on both feet, spangled but not wholly visible: darkness (κυάνεος) envelops the region below of his belly, but the tip of his jaw is struck with a terrible star, which indeed sears bitterly. And men call it Sirius.

Τοῖός οἱ καὶ φρουρὸς ἀειρομένῳ ὑπὸ νότῳ  
φαίνεται ἀμφοτέροισι Κύων ἐπὶ ποσσὶ βεβηκῶς,  
ποικίλος, ἀλλ' οὐ πάντα πεφασμένος· ἀλλὰ κατ' αὐτὴν  
γαστέρα κυάνεος περιτέλλεται, ἢ δέ οἱ ἄκρη  
ἀστέρι βέβληται δεινῷ γένυς, ὅς ῥα μάλιστα  
ὀξέα σειριάει· καί μιν καλέουσ' ἄνθρωποι  
Σείριον. (*Phaen.*326-32)

Sirius, the terrible star that is struck into the jaw of the Dog, is also inserted within the phrase that describes it, “ἢ δέ οἱ ἄκρη ἀστέρι βέβληται δεινῷ γένυς,” creating a parallel between the poetry and the constellation it describes. These aesthetic choices subtly illustrate the way words and celestial bodies behave analogously within the *Phaenomena*.

The Sirius constellation also demonstrates another of Aratus' favorite means of linking words to the natural phenomena they signify: etymology.<sup>221</sup> The “καί” in line 332 makes it clear that Sirius' name and the weather it brings are connected.<sup>222</sup> A further

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<sup>221</sup> The most direct example of Aratus' etymological wordplay is the small constellation, the Eagle, “αἰετός,” which is blown, “ἄηται,” beside a larger one (313-15). Pendergraft (1982), p. 38, offers a table of many etymological word games in the *Phaenomena*. She does not include the Κύων-κυάνεος link mentioned later in this paragraph, but she does list another pun involving a dog in 595. See also O'Hara (1996), pp. 35-36.

<sup>222</sup> Kidd makes the causal connection stronger than I believe the Greek supports: “...a formidable star, that blazes most intensely: and so men call it the Scorcher,” but it is nevertheless clear that the reader is supposed to reach that conclusion. Denniston (1954), p. 316, says that, “καί” everywhere denotes the connexion between two ideas, either expressed, or fairly implied,” but he offers no examples where a consecutive relationship is implicit in that connection, even without the use of ὥστε.

etymological link ties the shape of the Dog (“Κύων”) to the absence of stars in its stomach (“κυάνεος”), creating a dark space within the constellation.<sup>223</sup> This last pun is hardly intuitive and must surely be Aratus’ own invention, devised to underscore the fact that connections between our words and the stars need not be causative to exist. In some ways, this makes a stronger statement; it is not simply that we name constellations after the features of the stars within them, but rather that the powerful underlying connections between language and the heavens allow these connections to emerge. The fundamental link between the natural world and the humanistic way we interpret it is reflected in the words themselves.

These types of wordplay are peppered throughout the poem, but the most omnipresent stylistic feature of the *Phaenomena* is the use of Homeric diction. The density of these words, and Aratus’ commitment to using *hapax legomena* and words that were particularly marked in Homeric scholarship signals that his literary ancestry embraces all archaic epic, not just Hesiod’s *Works and Days*.<sup>224</sup> Occasionally, however, the Homeric references interact with the technical information they have been employed to express, and in the process, generate greater meaning. One example of this is the simile Aratus uses to describe the Snake between the Bears:<sup>225</sup>

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<sup>223</sup> See Stewart (2006) on terminology for the color blue in Aratus.

<sup>224</sup> On Aratus’ use of Homeric language, Kidd (1997), pp. 23-25, offers a good overview. The standard studies are Ronconi (1937) and Traina (1956). There are many instances in which the original passage is not relevant for its usage in Aratus’ text, but Kidd (1997), p.24, offers a number of other instances in which Aratus deliberately uses a word in a similar context to Homer, such as Aratus’ “Καὶ τὴν μὲν Κυνόσουραν ἐπίκλῃσιν καλέουσιν,” (*Phaen.*36), which recalls “Ἄρκτον θ’, ἦν καὶ Ἄμαξαν ἐπίκλῃσιν καλέουσιν.” (Hom.*Il.*18.487)

<sup>225</sup> Aratus refers to this constellation exclusively as ‘Δρακόν,’ whereas the other snake constellation (in the hand of the constellation Ὀφιοῦχος) is ‘Ὀφίς.’ Aratus is entirely consistent in his distinction between the two, although later writers often include additional information (“the Snake between the Bears” or “the Snake that is held”) to avoid any confusion, see Kidd (1997), p.192; 206. In the passage quoted below,

Through both of [the Bears] like a branch of a river whirls the great wonder, the Snake, winding around and about countless times. And the Bears are borne along on either side of his coils, guarding him from the dark ocean. But he is stretched by the tip of his tail towards one of them, while he cuts off the other with his coil. The tip of his tail ends beside the head of Helice, but Cynosura holds her head inside his coil. The coil winds down her head, and comes to her foot, and then it runs back up again. Not just one star shines out by itself in his head, but two for the temples, and two for the eyes. And one underneath marks off the limit of the jaw of the terrible monster. His head is slanted, just as if it were nodding to the tip of Helice's tail, and the mouth and right temple are in line with the tip of the tail. And the head itself comes to the point where the edges of the risings and settings mingle with one another.

Τὰς δὲ δι' ἀμφοτέρας οἷη ποταμοῖο ἀπορρῶξ  
εἰλεῖται, μέγα θαῦμα, Δράκων, περί τ' ἀμφί τ' ἐαγῶς  
μυρίος· αἱ δ' ἄρα οἱ σπείρης ἐκάτερθε φέρονται  
Ἄρκτοι, κυανέου πεφυλαγμένοι ὠκεανοῖο.  
Αὐτὰρ ὄγ' ἄλλης μὲν νεάτη ἐπιτείνεται οὐρῇ,  
ἄλλην δὲ σπεῖρη περιτέμνεται· ἢ μὲν οἱ ἄκρη  
οὐρῇ πὰρ κεφαλὴν Ἑλίκης ἀποπαύεται Ἄρκτου·  
σπεῖρη δ' ἐν Κυνόσουρα κάρη ἔχει· ἢ δὲ κατ' αὐτὴν  
εἰλεῖται κεφαλὴν, καὶ οἱ ποδὸς ἔρχεται ἄχρισ,  
ἐκ δ' αὐτὶς παλίνορσος ἀνατρέχει. Οὐ μὲν ἐκείνω  
οἰόθεν, οὐδ' οἷος κεφαλῇ ἐπιλάμπεται ἀστήρ,  
ἀλλὰ δύο κροτάφοις, δύο δ' ὄμμασιν· εἷς δ' ὑπένερθεν  
ἐσχατιὴν ἐπέχει γένυος δεινοῖο πελώρου.  
Λοξὸν δ' ἐστὶ κάρη, νεύοντι δὲ πάμπαν ἔοικεν  
ἄκρην εἰς Ἑλίκης οὐρῆν· μάλα δ' ἐστὶ κατ' ἰθὺ  
καὶ στόμα καὶ κροτάφοιο τὰ δεξιὰ νειάτω οὐρῇ.  
Κεῖνη που κεφαλὴ τῇ νίσσεται, ἥχι περ ἄκραι  
μίσγονται δύσιές τε καὶ ἀντολαὶ ἀλλήλησιν. (*Phaen.*45-62)

The importance of this passage is signaled by the phrase “μέγα θαῦμα,” in the same sedes as in the proem, where it describes Zeus.<sup>226</sup> In contrast to the mythology-heavy description of the Bears, Aratus focuses here on the technical details of the constellation, particularly its position relative to the two Bears. Hipparchus quotes lines 49-53 of this

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Eudoxus calls this constellation “Ὀφίς,” which shows that Aratus’ consistent terminology was not a convention adopted by all astronomical writers. As there is only one constellation between the Bears, there can be no doubt, however, that Eudoxus is referring to the same constellation.

<sup>226</sup> *Phaen.*15. Kidd (1997), p.193, suggests that the repetition of the phrase is “meant to suggest the awesomeness of the Dragon’s position dominating the universe,” in which case the connection to Zeus is apt.

passage beside Eudoxus' treatment of the constellation as his first proof that Aratus versified his treatise, but he fails to notice the level of poetic artistry within this passage, and does it a disservice by comparing it to the straightforward and quite dry description Eudoxus offers:

Between the Bears is the tail of the Snake (Ὀφίς), the last star of which is above the head of the Great Bear. And he has a coil beside the head of the Great Bear and is stretched under her feet. But, having another coil there, looking up again, he holds his head forward.

μεταξὺ δὲ τῶν Ἄρκτων ἐστὶν ἡ τοῦ Ὀφείως οὐρά, τὸν ἄκρον ἀστέρα ὑπὲρ τῆς κεφαλῆς ἔχουσα τῆς Μεγάλης Ἄρκτου. καμπὴν δὲ ἔχει παρὰ τὴν κεφαλὴν τῆς Μικρᾶς Ἄρκτου καὶ παρατέταται ὑπὸ τοὺς πόδας· ἑτέραν δὲ καμπὴν ἐνταῦθα ποιησάμενος πάλιν ἀνανεύων ἔμπροσθεν ἔχει τὴν κεφαλὴν.<sup>227</sup>

Aratus includes much of the same information, but presents it far more vividly.<sup>228</sup> He alternates between relating the Snake to Helice and then to Cynosura, switching back and forth like a coiling snake, and then repeats the same alternating process with his numbering of the stars: not one, but two, then two, then one. Hipparchus' abbreviated quotation cuts off the introduction of the passage, which includes the Homeric allusion, the seemingly unnecessary comparison to a river. In fact, the simile actually adds confusion, because not only is there another Snake constellation, there is also a River. But the term Aratus uses, 'ἀπορρῶξ,' reveals how deftly Aratus can use his Homeric allusions.

Homer uses the word "ἀπορρῶξ" four times, twice in the phrase, "Στυγὸς ὕδατός ἐστιν ἀπορρῶξ," in the same *sedes* as Aratus' usage, making this a clear reference to

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<sup>227</sup> Hipparch.1.2.3-4. See Pendergraft (1982), pp. 50-57, for a comparison of this passage and Aratus' treatment of the Snake.

<sup>228</sup> Zanker (1987), p. 97, calls this passage of the *Phaenomena* 'jejune,' an assessment I do not agree with.



these two identical phrases.<sup>229</sup> Both Homeric lines come in the context of rivers flowing into each other. The Odyssean line comes in Circe's directions to the Underworld:

“There the Pyriphlegethon flows into the Acheron, as does the Cocytus, which is a branch (ἀπορρώξ) of the Styx, and there is a rock at the meeting of the two resounding rivers.”<sup>230</sup>

The Iliadic line is in the catalog of ships, in an explanation on the Titaessus River, which, “pours into the beautiful-flowing Peneion water, but it does not mix with the silver-eddying Peneios, but flows on top of it like oil, for it is a branch (ἀπορρώξ) of the Styx, the marvelous river of oath.”<sup>231</sup> In both passages, two rivers come together, and their mixing or not mixing is specifically mentioned. In contrast, Aratus mentions explicitly that the Snake constellation is held back from mixing with the Ocean, creating an initial discordance between his own use of the word and Homer's. But the final lines of the passage push the question of mixing further, stating that the constellation revolves “ἤχι περ ἄκραι μίσγονται δύσιές τε καὶ ἀντολαὶ ἀλλήλησιν.”<sup>232</sup> The mixing occurring in the *Phaenomena* is that of the paths of the constellations, an unusual usage of “μίγνυμι” that highlights the connection to the Homeric passages, especially the Iliadic line that uses the same verb.<sup>233</sup> Both the contrast with and the similarity to the Homeric line

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<sup>229</sup> Hom.*Il.*2.755; *Od.*10.514. According to Σ (M), the line also establishes Aratus as a ‘ζηλωτής’ of Hesiod, who apparently compared a river to a snake in an unnamed work (Hes.fr.70.23). See Kidd (1997), p.192.

<sup>230</sup> Hom.*Od.*10.513-15: “ἔνθα μὲν εἰς Ἀχέροντα Πυριφλεγέθων τε ῥέουσιν/ Κώκυτός θ' ὅς δὴ Στυγὸς ὕδατός ἐστιν ἀπορρώξ/ πέτρῃ τε ξύνεσις τε δύο ποταμῶν ἐριδούπων.”

<sup>231</sup> Hom.*Il.*2.752-55: “ῥ' ἐς Πηνειὸν προΐει καλλίρροον ὕδωρ/ οὐδ' ὅ γε Πηνειῷ συμμίσγεται ἀργυροδίνῃ/ ἀλλὰ τέ μιν καθύπερθεν ἐπιρρέει ἠΰτ' ἔλαιον:/ ὄρκου γὰρ δεινοῦ Στυγὸς ὕδατός ἐστιν ἀπορρώξ.”

<sup>232</sup> *Phaen.*61-62.

<sup>233</sup> It is tempting to see a connection here to Callimachus' metapoetic metaphor of rivers and Ocean and Homer. See fn. 354 for bibliography on this subject. The extreme difficulty of determining the relative chronology between Aratus and Callimachus prevents me from making any such argument, but certainly, this could very well also be an element of this passage. In addition, it is also possible that Callimachus

highlight the position of the constellation, at the north pole of the universe. The reference to the Styx is resonant as well. The Styx flows at the conceptual boundary of the known world, between life and death. The Snake's liminal position is more literal, at the very northern apex of the kosmos, but equally weighty. One can understand the passage without knowledge of the Homeric lines, and the use of "ἀπορρώξ" stands on its own without further explication required. But the more information the reader has, the clearer the connections within the passage emerge and the more prominently the importance of the passage, i.e., the position of the Snake at the very top of the universe, emerges.

Throughout the poem, Aratus demonstrates his deft and masterful command of language. The *Phaenomena* is rich with poetic artistry: Homeric allusions, puns, and especially the notorious acrostic. More than simply proving his skill, his poetic flourishes also highlight the connections between the words and the things they signify. The lines of the poem themselves depict the phenomena they describe, the stars in the sky and the Homeric references mirror each other, and even Zeus' name ties the mythological and the scientific together. The versatility and variety of the σήματα in the sky is reflected in the flexibility of the word itself. Aratus' dexterous use of language provides deeper meaning to the information conveyed within it.

### **III. Cosm(et)ic Patterns**

Whereas the previous section focused on the small-scale linguistic links within the poem, this section will address larger connections. These connections are predicated on the

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developed this metaphor from Aratus, as Cameron (1995), pp. 324-26, argues for the metaphor of λεπτότης.

patterns that pervade the universe and the poem. Patterns provide the explanation for the surety of the signs in the constellations. That is, the regular motion of the stars allows the constellations to provide reference to the information they signify. Aratus celebrates this regular motion immediately after the end of the proem: “The multitude [i.e., the stars] all hither and thither, are dragged through the sky, every day, constantly and always.”<sup>234</sup> Here the accumulation of words indicating permanence at the end of the line, “πάντ’ ἡματα συνεχῆς αἰεί,” underscores the repetition and regularity of the motion, despite the seeming disarray of the “ἄλλυδις ἄλλοι” stars.<sup>235</sup> Order emerges from seeming chaos, creating patterns.

These larger-order patterns of the universe are an important theme in the poem, as has been discussed by other scholars.<sup>236</sup> Stoic readings of the *Phaenomena* in particular have seized on the importance of patterns in the poem to support this interpretation, because Zeno and Chrysippus saw the universe operating with a complicated but intersecting network of patterns.<sup>237</sup> Patterns occur in the physical world and in the text of *Phaenomena*, as can be seen in the broad organization of the poem.<sup>238</sup> Aratus arranges the constellations in a systematic organization that begins at the north pole of the universe, and gradually moves south in wedge-shaped bands. The meteorological section begins with weather signs from the moon and sun, then switches to an organization based on the signified weather and offers signs utilizing birds and shooting stars, to insects and farm

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<sup>234</sup> *Phaen.*19-20: “Οἱ μὲν ὁμῶς πολέες τε καὶ ἄλλυδις ἄλλοι ἐόντες/ οὐρανῷ ἔλκονται πάντ’ ἡματα συνεχῆς αἰεί.”

<sup>235</sup> Kidd (1997), p. 177.

<sup>236</sup> Fantuzzi and Hunter (2004), p. 243; Haslam (1992).

<sup>237</sup> Erren (1967), p.20, uses this type of argument; On Stoic ideas about patterns in the universe, Cic. *ND*.2.12-15, offers some of the best evidence.

<sup>238</sup> On the organization of the poem, see Martin (1998), pp.xlix-lxxxv. Ludwig (1963), p.429, emphasizes the importance of the plan of the poem to assessing it.

animals.<sup>239</sup> The poem thus moves from the highest realm of the universe in the astronomical section, gradually down to the lowest, through the meteorology. The orderly progressive movement in the organization of the poem imitates the regular, patterned movement of its subject matter.

The importance and ubiquity of patterns is demonstrated in the most famous passage of the poem, the Dike catasterism, which contains a Hesiodic Myth of Ages, clearly modeled on the Works and Days.<sup>240</sup> In fact, the comparison with its inspiration allows the importance of patterns to emerge more clearly. The passage begins as a description of the Maiden constellation, but quickly develops into a discussion of the history of the human race:

Below both the feet of Bootes, you can see the Maiden, who carries in her hand the shining star, Spica. Whether she is the offspring of Astraeus, whom they say is the ancient father of the stars, or of someone else, may she be borne along free from care! Another story circulates among people, that once she was actually earth-bound, and came face to face with humans, and she never rejected the tribes of ancient men nor of ancient women, but she sat among them, even though she was immortal. They called her Dike, and assembling the chieftains either in the market-place or in the wide-wayed avenue, she sang them communal laws and encouraged them. Not yet did they understand painful strife, nor blameworthy disputes, nor the din of battle. And they lived in this way: the hard sea was unknown, and not yet did ships bring sustenance from far away, but cattle and ploughs and Dike herself, the queen of the people, supplied everything, the bestower of justice. This lasted as long as the earth nourished the Golden Race. But with the Silver Race, she mingled little, and not entirely eagerly, yearning for the customs of the ancient people. But nevertheless, she still consorted with them. She would come down alone from the echoing mountains in the evening, but she did not mix with anyone favorably anymore, but rather, whenever she had filled great slopes with people, she would threaten them, upbraiding them for wickedness and saying that she would no longer come openly among them, if they called her. "Such offspring your golden fathers bore, so much worse! And you will bear even worse children yourselves. And mankind will have wars and

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<sup>239</sup> Shooting stars were typically considered a sub-lunar phenomenon in antiquity and therefore do not break the pattern Aratus has constructed. See Arist.*Meteor.*1.3.

<sup>240</sup> *Phaen.*96-136. See Porter (1946).

hostile bloodshed, and misery will come upon those evil men.” After she said this, she set off for the mountains and left the people looking around for her everywhere. And when they died, the Bronze Race arose, men more baneful than those before, who first forged the evil highway (ειβοδίην) knife and who first tasted the plough-ox. And Dike, hating this race of men, flew up into the heavens and settled there, where even still she shines all night for mankind, near far-seen Bootes.

Ἀμφοτέροισι δὲ ποσσὶν ὕπο σκέπτοιο Βοώτεω  
Παρθένον, ἧ ῥ' ἐν χειρὶ φέρει Στάχυν αἰγλήεντα.  
Εἶτ' οὖν Ἀστραίου κείνη γένος, ὃν ῥά τέ φασιν  
ἄστρον ἀρχαῖοι πατέρ' ἔμμεναι, εἶτε τευ ἄλλου,  
εὐκηλος φορέοιτο. Λόγος γε μὲν ἐντρέχει ἄλλος  
ἀνθρώποις, ὡς δῆθεν ἐπιχθονή πάρος ἦεν,  
ἦρχετο δ' ἀνθρώπων κατεναντίη, οὐδέ ποτ' ἀνδρῶν  
οὐδέ ποτ' ἀρχαίων ἠνήνατο φῦλα γυναικῶν,  
ἀλλ' ἀναμιξ' ἐκάθητο καὶ ἀθανάτη περ ἐοῦσα.  
Καὶ ἐ Δίκην καλέεσκον· ἀγειρομένη δὲ γέροντας  
ἠέ που εἰν ἀγορῇ ἢ εὐρυχόρῳ ἐν ἀγυῖῃ,  
δημοτέρας ἦειδεν ἐπισπέρχουσα θέμιστας.  
Οὐπω λευγαλέου τότε νεΐκεος ἠπίσταντο,  
οὐδὲ διακρίσιος περιμεμφέος, οὐδὲ κυδοιμοῦ·  
αὐτως δ' ἔζων· χαλεπὴ δ' ἀπέκειτο θάλασσα,  
καὶ βίον οὐπω νῆες ἀπόπροθεν ἠγίνεσκον,  
ἀλλὰ βόες καὶ ἄροτρα καὶ αὐτὴ πότνια λαῶν  
μυρία πάντα παρεῖχε Δίκη, δώτειρα δικαίων.  
Τόφρ' ἦν ὄφρ' ἔτι γαῖα γένος χρύσειον ἔφερβεν.  
Ἀργυρέῳ δ' ὀλίγη τε καὶ οὐκέτι πάμπαν ἐτοίμη  
ὠμίλει, ποθέουσα παλαιῶν ἠθεα λαῶν.  
Ἀλλ' ἔμπης ἔτι κείνο κατ' ἀργύρεον γένος ἦεν·  
ἦρχετο δ' ἐξ ὀρέων ὑποδείελος ἠχηέντων  
μουνάξ, οὐδέ τεῶ ἐπεμίσητο μελιχίοισιν·  
ἀλλ' ὀπότε ἀνθρώπων μεγάλας πλήσαιτο κολῶνας,  
ἠπεῖλει δὴ ἔπειτα καθαπτομένη κακότητος,  
οὐδ' ἔτ' ἔφη εἰσωπὸς ἐλεύσεσθαι καλέουσιν.  
“Οἷν χρύσειοι πατέρες γενεὴν ἐλίποντο  
χειροτέρη· ὑμεῖς δὲ κακώτερα τέκνα τεκεῖσθε.  
Καὶ δὴ που πόλεμοι, καὶ δὴ καὶ ἀνάρσιον αἷμα  
ἔσσειται ἀνθρώποισι, κακῶ δ' ἐπικείσεται ἄλγος.”  
“Ὡς εἰποῦσ' ὀρέων ἐπεμαίετο, τοὺς δ' ἄρα λαοὺς  
εἰς αὐτὴν ἔτι πάντας ἐλίμπανε παπταίνοντας.  
Ἀλλ' ὅτε δὴ κάκεῖνοι ἐτέθνασαν, οἱ δ' ἐγένοντο,  
χαλκεῖη γενεὴ προτέρων ὀλοώτεροι ἄνδρες,  
οἱ πρῶτοι κακοεργὸν ἐχαλκεύσαντο μάχαιραν  
εἰβοδίην, πρῶτοι δὲ βοῶν ἐπάσαντ' ἀροτήρων.

Καὶ τότε μισήσασα Δίκη κείνων γένος ἀνδρῶν  
ἔπταθ' ὑπουρανίη, ταύτην δ' ἄρα νάσσατο χόρην,  
ἧχί περ ἐννυχίη ἔτι φαίνεται ἀνθρώποισι.<sup>241</sup> (*Phaen.* 96-135)

The passage has inspired interpretations and readings as varied as those of the poem as a whole. The relationship to Hesiod's own Myth of Ages has naturally functioned as a starting point, as this passage marks the clearest debt Aratus owes to his predecessor.<sup>242</sup> Scholars have used it frequently to discuss the philosophical differences between Hesiod's and Aratus' anthropology, and specifically the optimistic note on which Aratus ends, compared to Hesiod's rather depressing dénouement.<sup>243</sup> Alessandro Schiesaro has read political undertones into the passage, which he views as a hidden address to the poet's patron, Antigonus Gonatus.<sup>244</sup> Fakas focused on the equivocating language that introduces the myth as an example of Aratus' Alexandrianism and lack of true piety.<sup>245</sup> Emma Gee reads the reference to eating cows in the Bronze Age and cyclical motion within the passage as Empedoclean allusions.<sup>246</sup> In sum, it is clear to all readers that this passage is very important, thematic for the work as a whole, and extraordinarily polysemous. There is not enough space here to completely dissect this passage, or to thoroughly address all of the readings and arguments about it. Instead, I would like to

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<sup>241</sup> On the meaning of “εἰνοδίην” (132), see Kidd (1997), p. 229. I have yet to find an English translation that I agree with.

<sup>242</sup> Wilamowitz (1924), II. 65; Porter (1946); Ludwig (1963). Solmsen (1966) offers a thorough overview of the extensive earlier scholarship on the passage.

<sup>243</sup> Norden (1893) is an early attempt to explain these discrepancies as a result of Aratus' Stoicism, to the vociferous objection of Wilamowitz (see Solmsen (1966), p. 126). Schütze (1935) and Ludwig (1963) also make this argument.

<sup>244</sup> Schiesaro (1996). Solmsen (1966), p. 127, suggests Antigonus Gonatus would have read it this way, although he does believe Aratus meant the passage specifically for him.

<sup>245</sup> Fakas (2001), pp. 151-60.

<sup>246</sup> Gee (2013), p.29.

focus on the patterns within the passage, which have not received much attention, as an important link between the catasterism and the rest of the poem.

These patterns appear especially clearly when the poem is compared to its literary inspiration, the Myth of Ages in the *Works and Days*. In Hesiod's poem, the Golden Age is undeniably the best, and the Silver and Bronze are each progressively worse. But the Age of Heroes disrupts the pattern, and its men are far better than the previous two generations: "Zeus, the son of Cronos made a divine race of heroes, more just and better, whom he called half-divine, the most recent race on the expansive earth."<sup>247</sup> These men are not quite as good as the Golden Age; they still fight wars, after all, but they definitely improve on the last two iterations, and are succeeded by much worse. There is therefore no definable pattern to the progress and decline of the human race, but rather, it varies unpredictably. This is also evident by the way the Age of Heroes breaks up the otherwise clear metallic progression.<sup>248</sup> Aratus, in his interpretation of the myth, streamlines Hesiod's races, and thus creates a clearly definable pattern.<sup>249</sup> The Golden Age is best, then Silver, then Bronze.

This is hardly the only pattern that emerges throughout the three generations. Dike gradually moves away from human civilization, first coming "κατεναντή" and sitting "ἀναμιξ," then only to the edges of human settlement, and threatening that "she would no longer come openly among them, if they called her," until finally she makes

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<sup>247</sup> "Ζεὺς Κρονίδης ποίησε, δικαιοτέρον καὶ ἄρειον./ ἀνδρῶν ἡρώων θεῖον γένος, οἱ καλέονται/ ἡμίθεοι, προτέρη γενεῆ κατ' ἀπείρονα γαίαν." (Hes. *Erg.* 158-160)

<sup>248</sup> See West (1978), p. 174, on the possible interpolation of the Age of Heroes, and pp. 172- 77, on the Hesiod passage more generally. The division of the Ages in the *Works and Days* has been historically a contentious subject, see, in opposition, Vernant (1965), pp. 19-47, and Walcot (1961). The debate about how many ages there are in the passage only shows how much messier Hesiod's version is, than Aratus'.

<sup>249</sup> Fantuzzi and Hunter (2004), p. 240, attribute Aratus' curtailment of the story to a desire to set the Dike catasterism before recorded history, and therefore before the Ages of Heroes and Iron.

good on her threat and flees to the sky.<sup>250</sup> As she retreats from humans, time also progresses. In the Golden Age, she interacts with humans in the agora and highway, and promotes farming, all of which indicate daytime activity. In the Silver Age, she only comes out “ὕποδείελος,” and finally when she retreats to the heavens, she shines out “ἔννοχίη.”<sup>251</sup> In the same way, her altitude increases in each age. She first operates on flat farmland and in market places, then in the mountains and hills, and finally up in the sky. As the generations progress, we gradually watch Dike become a constellation. She is at first largely static, sitting among people.<sup>252</sup> In the Silver Age, she begins to move, tellingly, in a circular motion, coming out from the mountains to address humans and then retreating back into them. Finally, as a constellation, she has reached her final form, rotating around the earth.<sup>253</sup> There are other small patterns, but these should suffice to demonstrate that Aratus took pains to make all the details significant throughout the passage.

It is also significant that the maiden is Dike. Usually translated as ‘justice,’ δίκη signifies a much more subtle concept, which connotes order and balance, particularly for many Presocratic philosophers.<sup>254</sup> The goddess whose story exhibits so much orderly motion of patterns herself embodies this concept within her name. The passage, probably the most important of the entire poem, highlights the power of patterns and order in the universe.

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<sup>250</sup> *Phaen.*102; 104; 122; 134.

<sup>251</sup> *Phaen.*118; 135.

<sup>252</sup> *Phaen.*103: “ἔκαθητο.”

<sup>253</sup> See Kidd (1997), pp. 215-31.

<sup>254</sup> Lloyd-Jones (1983), pp.79-81. The idea seems to have originated with Anaximander, but had a profound impact on Heraclitus, among others. See also Kirk, Raven, Schofield (1995), pp. 193-94. For this reason, I have elected not to translate her name.



Among Quintilian's many complaints about the *Phaenomena* is the lack of direct speech, which suggests he did not read this passage carefully.<sup>255</sup> It may be the only one in the entire poem, but Dike's speech is crucial, because it shows why these patterns are so important. She exclaims, "Such offspring your golden fathers bore, so much worse! And you will bear even worse children yourselves. And mankind will have wars and hostile bloodshed, and misery will come upon those evil men."<sup>256</sup> Dike has seen the pattern in human development already, and uses it as evidence for future occurrences. As the only direct speech in the entire poem, lying at the center of this pointedly thematic passage, this statement bears enormous weight. Aratus chooses to use that platform to show a character pointing out and extrapolating from a pattern. This is what he hopes from his reader, to find the patterns within the poem and the universe and use them to predict later outcomes. The patterns in the stars can tell us the time of year, the patterns of the seasons can tell us when to plant, and patterns in the weather help us to understand what will happen to our crops and our boats. It is our responsibility, as the readers, to find the patterns and interpret them correctly.

This passage can be described as "literary." It departs from the description of the position of the Maiden constellation, the official subject of this passage, to tell an extended narrative, and it is clearly meant as a generic marker, linking the *Phaenomena* to Hesiod's *Works and Days*. However, the message it presents about the ubiquity of patterns and their necessity for the recognition of signs directly ties into the scientific

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<sup>255</sup> Quint.10.1.55: "arati materia motu caret, ut in qua nulla varietas, nullus adfectus, nulla persona, nulla cuiusquam sit oratio." "Aratus' material lacks passion, such that in it there is no variety, no warmth, no characters, no speech by anyone."

<sup>256</sup> *Phaen.*123-34.

aims of the work, and reveals the theoretical underpinnings of Aratus' message. This passage, so important in so many ways, perfectly encapsulates how non-discrete the literary and scientific aspects of the poem are. Rather than a digression, it directly pertains to the poet's scientific *Weltanschauung*.<sup>257</sup>

Furthermore, often patterns emerge that cannot be isolated to either the phenomena described or the poetic techniques that Aratus uses to describe them. The 'Cepheus group' of constellations is an excellent example of this.<sup>258</sup> The passage is particularly rich, including important descriptions of the Horse, the Pleiades, and the Triangle. But the passage is dominated by four mythologically connected constellations: Cepheus, Cassiopeia, Andromeda, and Perseus. Aratus begins the passage with father, mother, and daughter, and leaves Perseus until the very end of the passage, using mythology to bracket the other constellations within this group.<sup>259</sup> These constellations are linked immediately in our own minds by the myth that they all participate in. Aratus never lets us forget this story. The bonds that tied Andromeda to the rocks in the ocean are still on her in the sky, and Perseus is her "γαμβρός," who points to the chair of his "πενθερίου."<sup>260</sup> Cepheus' is a "μογερόν γένος," and Cassiopeia is "δαιμονίη," such that

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<sup>257</sup> E.g., Kidd (1997), p.216: "Placed at this juncture, the passage also brings some poetic relief after the detailed technicalities required by the description of the preceding constellations." See also Fakas (2001), p.149, n.2.

<sup>258</sup> *Phaen.* 179-267.

<sup>259</sup> Kidd (1997), p. 248, defines the Cynosura Group as the constellations I group here, plus the constellation immediately following Perseus, the Pleiades. The Pleiades are included within the passage by Kidd because they are found from Perseus, and the next constellation is found from the Kneeler, a switch of point of reference, but in the structure of the poem, they are separate from the main group of constellations. Without them, this shorter passage is bracketed by Cepheus and Perseus, and, more specifically, by references to Zeus as their ancestor progenitor. Cepheus' family is immediately described as "Διὸς ἐγγύθεν" (181), and Cepheus' father Iasius is explicitly named, and Perseus' depiction ends with a reference to his path "ἐν Διὶ πατρὶ" (253). For this reason, I am considering the passage ending with Perseus.

<sup>260</sup> *Phaen.* 203; 248; 252.

“you would say she cried out for her child.”<sup>261</sup> Andromeda herself is “αἰνὸν.”<sup>262</sup> The repeated emphasis of suffering could be a reference to the proliferation and popularity of Attic tragedies about the family, which may even have been responsible for the creation of the constellations themselves.<sup>263</sup> Another connection to this myth is left unspoken. Aratus makes clear that the Horse is Pegasus, but never mentions its connection to Perseus.

The constellations also have other connections to one another, unrelated to the myth that ties them together. Each has outstretched hands: Cepheus is “like someone stretching both his hands,” and Cassiopeia “stretches out a fathom from her small shoulders.”<sup>264</sup> Andromeda’s outstretched arms are mentioned twice: she “lies with outstretched arms,” and only two lines later, “those hands of hers are raised and spread wide there for all time.”<sup>265</sup> Perseus, on the other hand, only stretches out his right hand, “οἱ δεξιτερῆ ... τετάνυσται.”<sup>266</sup> In typical Aratean fashion, each of these expressions bears similarity to the others, but none are exactly the same, as the poet finds five separate ways to describe the same physical position. He also makes an etymological pun, using “ἀποτείνεται” in Cassiopeia’s description, among the varied forms of τανύω, as well as a Homeric reference, using “πεπταμέναι,” a word more typically used to

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<sup>261</sup> *Phaen.*179; 188; 196: “φαίης κεν ἀνιάξειν ἐπὶ παιδί.”

<sup>262</sup> *Phaen.*197.

<sup>263</sup> Kidd (1997), p. 248. See also Fakas (2001), pp. 479-80.

<sup>264</sup> *Phaen.*183: “Κηφεὺς ἀμφοτέρως χεῖρας τανύοντι ἐοικώς;” 195-96: “ἡ δ’ αὐτως ὀλίγων ἀποτείνεται ὤμων/ ὀργυιήν.”

<sup>265</sup> *Phaen.*202: “διωλενίη τετάνυσται;” 203-04: “αἱ δ’ ἀνέχονται/ αὐτοῦ πεπταμέναι πάντ’ ἤματα χεῖρες ἐκείναι.”

<sup>266</sup> *Phaen.*251.

describe flying (which would not be out of context here), with a specific Homeric meaning.<sup>267</sup>

Not only hands, but also feet are mentioned prominently in all these constellations, often as reference points for other constellations. Cepheus' two feet and the tip of Cynosura's tail create an equilateral triangle.<sup>268</sup> Andromeda's feet, not mentioned in Eudoxus, are included among the especially bright stars of Andromeda, and later serve as reference points for Perseus.<sup>269</sup> His pursuit is described as, “τὰ δ’ ἐν ποσὶν οἷα διώκων/ ἴχνια.”<sup>270</sup> The repeated use of “πούς” in these constellations (three times in Cepheus, once in Andromeda, and twice in Perseus) invites a metapoetic interpretation, perhaps hearkening again to the tragic inspiration for the constellations. They may also relate to the metapoetic valence of the prominent foot in the Horse constellation, which will be discussed later in greater detail.

The mother and daughter constellations share descriptions of being exceptionally bright and visible. Cassiopeia is “νυκτὶ φαεινομένη παμμήνιδι,” and Andromeda is “κεκασμένον.”<sup>271</sup> Aratus goes further with Andromeda, telling the addressee, that “truly, I do not predict that you will have to carefully observe the night to see her very quickly, so bright (τοίη) is her head, and both her shoulders, and the tips of her feet and her whole

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<sup>267</sup> Kidd (1997), p. 258.

<sup>268</sup> *Phaen.*184-85.

<sup>269</sup> *Phaen.*201; 249.

<sup>270</sup> *Phaen.*252-53.

<sup>271</sup> *Phaen.*189; 198.

belt.”<sup>272</sup> Both women are bright and easy to find, and the connection between them is underscored by Andromeda’s position “ὑπὸ μητρὶ.”<sup>273</sup>

Other smaller connections between constellations abound within the passage, such as how the triangle Cepheus is inscribed within foreshadows the Triangle constellation below his daughter. These two constellations are also linked by the echo of the “στάθμη” from Cynosura’s tail to each of Cepheus’ feet in “ἑστάθηται,” referring to the isosceles nature of the Triangle.<sup>274</sup> The “δεσμά” that bind Andromeda are echoed in the “δεσμά” that extend from the tails of the Fishes.<sup>275</sup> The Ram is described as, “μήκιστα διωκόμενος περὶ κύκλα,” whereas Perseus, “τὰ δ’ ἐν ποσὶν οἶα διώκων/ ἴχθια μηκύνει.”<sup>276</sup> These are Aratus’ own creations, small links that connect the otherwise extraneous constellations to the central group.

This passage shows in microcosm what the use of the word σῆμα throughout the poem reveals on a larger scale: the variations on a theme, creating patterns of great complexity. Ostensibly, these constellations are grouped together because they are all easily identified from Cynosura. However, Aratus shows that the links between them resonate in the shapes of the constellations, in the myths that inspire them, and in the language he uses to describe them, finding patterns on the cosmological, mythological, and poetic level. To demonstrate how carefully constructed this is, I return to a brief comment he makes, while describing Andromeda: “Bonds are laid upon her, even in the

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<sup>272</sup> *Phaen.*198-201: “οὐ σε μάλ’ οἶω/ νύκτα περισκέψεσθαι, ἴν’ αὐτίκα μάλλον ἴθιαι;/ τοίη οἱ κεφαλῆ, τοίη δέ οἱ ἀμφοτέρωθεν/ ὄμοι καὶ πόδες ἀκρότατοι καὶ ζώματα πάντα.”

<sup>273</sup> *Phaen.*198.

<sup>274</sup> *Phaen.*184; 234.

<sup>275</sup> *Phaen.*203; 242-43.

<sup>276</sup> *Phaen.*226; 253-54.

heavens.”<sup>277</sup> This refers most directly to the bonds used to tie her down as a sacrifice to the sea monster, but throughout the passage, it becomes clear that other kinds of bonds also lie upon Andromeda. She links all the mythological characters together, of course, tying her parents to her husband, but she also ties together all the other constellations. She is the reference point for every constellation that comes after her, until Perseus. Her head and the belly of the Horse overlap; you can make out the Ram from her girdle; the Triangle is formed beneath her; her left shoulder is the σῆμα of the Northern Fish; and her feet even “ἐπισημαίνουεν” Perseus himself.<sup>278</sup> She is the nexus point that ties all the other constellations together, because she is tied to each of them just as she was to the rocks in the ocean. The patterns of this constellation group, astronomical, mythological, and poetic, all center on her.

Aratus’ use of larger scale poetic and explanatory techniques cannot be separated into independent concerns, but rather they overlap and inform each other. The organization of the poem reflects the organization of the cosmos, the poetic techniques that are considered extraneous to the Eudoxan content of the poem develop his theoretical stance, and the patterns themselves cross lines, connecting constellations in mythological, scientific, and poetic ways.

#### **IV. Reading the Cosmos from Proem to Epilogue**

Many of the examples in the previous section demonstrate ways in which the form of the poem informs or clarifies the content, such as how the Dike catasterism actually reflects

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<sup>277</sup> *Phaen.*203: “δεσμὰ δέ οἱ κείται καὶ ἐν οὐρανῷ.”

<sup>278</sup> *Phaen.*205-07; 229-30; 233-34; 246-47; 248.

the cosmological patterns necessary to understanding the constellations. This may suggest, incorrectly, that the work is primarily scientific, and the poetry is ancillary to the larger, scientific, goals of the text. Form does explicate content, but the content of the poem also helps to define and clarify the purpose of the form, Aratus' poetics, and this will be explored in the following section. Scholars have occasionally discussed this, such as Richard Hunter's study of how the different uses of *kosmos* are relevant within the poem, or Volk's recent article suggesting Aratus sees the constellations much like words.<sup>279</sup>

In the following section, I will attempt to draw larger conclusions about Aratus' poetics from the relationship to his semiology. But first, his theory of signs requires greater explanation. The poem repeatedly returns to the idea of human reception and interpretation of signs in several programmatic passages, and though expressed only in relation to the stars and the weather, these passages also provide insight into how Aratus' reader is expected to interpret the *poetic* signs in the work. The interpretation of signs is, in my view, one of the most important themes in the poem, but it has not received much scholarly attention.<sup>280</sup> In this section, I will demonstrate how readings of the poem that focus on the poem as a key to understanding it are incomplete, and that the theme of human inference from signs can provide a fuller understanding of Aratus' theory of signs.

Scholars have typically used the so-called "Hymn to Zeus" as a key to understanding the poem as a whole.<sup>281</sup> Openings have had a weighted importance since

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<sup>279</sup> Hunter (1995a), section 2; Volk (2012).

<sup>280</sup> The notable exception is Volk (2010).

<sup>281</sup> Erren (1967), pp. 9-10; Fakas (2001), pp. 5-11; Kidd (1997), p.11; Fantuzzi and Hunter (2004), pp.224-25; Volk (2010), pp. 200-201.

Homer and Hesiod, and Aratus' proem contains a far greater density of archaic language than the remainder of the poem, particularly the language of the Homeric Hymns.<sup>282</sup> It also introduces the major themes of the poem: the ubiquity of signs and their usefulness:

Let us begin from Zeus, whom we men never leave unmentioned. All of the highways are filled with Zeus, and all the assemblies of men, and as are the sea and the harbors. We all encounter Zeus at all times, for we are indeed of his race. And he, favorable to men, gives auspicious signs and rouses the people to work, recalling them to their livelihood. He announces when the clod is best for cattle and mattocks, and he announces when the seasons are favorable both for growing plants and sowing seeds. He himself fixed the signs in the heavens, delineating the constellations, and he organized the stars in the year so that they would give ready signs of the seasons to men, so that everything would grow securely. For this reason, they always worship him first and last.

Greetings, father, great wonder, great blessing to mankind, you yourself and the older generations. And may the Muses rejoice, always propitious. If it is right that I pray for you to tell me of the stars, mark out my whole song.<sup>283</sup>

Ἐκ Διὸς ἀρχώμεσθα, τὸν οὐδέποτε ἄνδρες ἔωμεν  
ἄρρητον· μεστὰ δὲ Διὸς πᾶσαι μὲν ἀγυαί,  
πᾶσαι δ' ἀνθρώπων ἀγοραί, μεστὴ δὲ θάλασσα  
καὶ λιμένες· πάντη δὲ Διὸς κεχρήμεθα πάντες.  
Τοῦ γὰρ καὶ γένος εἰμέν. Ὁ δ' ἦπιος ἀνθρώποισι  
δεξιὰ σημαίνει, λαοὺς δ' ἐπὶ ἔργον ἐγείρει  
μιμνήσκων βιότοιο· λέγει δ' ὅτε βῶλος ἀρίστη  
βουσί τε καὶ μακέλησι, λέγει δ' ὅτε δεξιαὶ ὦραι  
καὶ φυτὰ γυρῶσαι καὶ σπέρματα πάντα βαλέσθαι.  
Αὐτὸς γὰρ τὰ γε σήματ' ἐν οὐρανῷ ἐστήριξεν  
ἄστρα διακρίνας, ἐσκέψατο δ' εἰς ἐνιαυτὸν  
ἀστέρας οἳ κε μάλιστα τετυγμένα σημαίνοιεν  
ἀνδράσιν ὥράων, ὅφρ' ἔμπεδα πάντα φύωνται.  
Τῷ μιν αἰεὶ πρῶτόν τε καὶ ὕστατον ἰλάσκονται.

Χαῖρε, πάτερ, μέγα θαῦμα, μέγ' ἀνθρώποισιν ὄνειαρ,  
αὐτὸς καὶ προτέρη γενεή. Χαίροιτε δὲ Μοῦσαι  
μελίχαι μάλα πᾶσαι. Ἐμοί γε μὲν ἀστέρας εἰπεῖν

<sup>282</sup> Fakas (2001), pp. 5-11, on Aratus' relationship to the tradition of poetic openings. The influence of the Homeric Hymns on this passage has been underemphasized, compared to the influence of Hesiod and Homeric epic, but Kidd (1997), *passim* pp. 162-74, gives some concrete examples.

<sup>283</sup> I have used Kidd's translation of "ἐσκέψατο," see Kidd (1997), p.169.



ἢ θέμις εὐχομένῳ τεκμήρατε πᾶσαν ἀοιδήν. (*Phaen.*1-18)

The generally accepted interpretation is that the proem explains the importance of the subject matter for the rest of the poem, establishes the centrality of Zeus, and celebrates his beneficence in creating the signs that the remainder of the poem outlines. It also promotes a Stoic monotheistic conception of the universe, cementing Zeus' place as the one god in all roles typically assigned to other deities.<sup>284</sup> Zeus is not, however, the only concern of the poem. Even in the proem, Aratus mentions humans six times. From the very beginning, Aratus spotlights the ultimate receivers of these cosmic messages.

The typical Zeus-centric interpretation of the poem informed by the proem makes the ending problematic, because it omits any reference to the god at all. This elision is particularly marked, because the poem ends with a 12- line epilogue that neatly balances the proem in structure and theme, but not in content:

Do not look down on any of these [signs]. It is good to look for one sign next to another. Hope should arise when two point to the same thing, and with a third, you may take courage. Always count up the signs of the passing year, making note whether such a morning should appear with a star rising or setting as the sign would predict. It would be very helpful to consider the four days at the end and beginning of the month. For these days hold together the limits of the converging months, when the sky is more uncertain for eight nights, because of the absence of the bright moon. Examining all of the signs together in the year, you will never haphazardly conjecture from the sky.

Τῶν μηδὲν κατόνοσσο· καλὸν δ' ἐπὶ σήματι σῆμα  
σκέπτεσθαι· μᾶλλον δὲ δυεῖν εἰς ταῦτόν ἰόντων  
ἐλπωρῆ τελέθει· τριτάτῳ δέ κε θαρσῆσειας.

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<sup>284</sup> Kidd (1997), p. 165, points out that Aratus mixes together references to the traditional domains of Zeus (*ἀγοραῖος* and *λιμένιος* are both attested epithets for Zeus, see *A.Eum.*973 and *Paus.*2.34.112, respectively) with ones typically assigned to other deities (*ἀγυιεύς* is a common epithet of Apollo, see *Eur.Ph.*631; and the sea of course to Poseidon).

Αἰεὶ δ' ἂν παρίοντος ἀριθμοίης ἐνιαυτοῦ  
 σήματα συμβάλλον εἴ που καὶ ἐπ' ἀστέρι τοίη  
 ἤως ἀντέλλοντι φαίνεται ἢ κατιόντι,  
 ὀπποῖην καὶ σῆμα λέγοι· μάλα δ' ἄρκιον εἶη  
 φράζεσθαι φθίνοντος ἐφισταμένοιο τε μηνὸς  
 τετράδας ἀμφοτέρας· αἱ γάρ τ' ἄμυδις συνιόντων  
 μηνῶν πείρατ' ἔχουσιν, ὅτε σφαλερώτερος αἰθὴρ  
 ὀκτῶ νυξὶ πέλει χήτει χαροποῖο σελήνης.  
 Τῶν ἄμυδις πάντων ἐσκεμμένος εἰς ἐνιαυτὸν  
 οὐδέποτε σχεδίως κεν ἐπ' αἰθέρι τεκμήραιο. (*Phaen.*1142-54)

This conclusion, full of practical advice, seems somewhat anticlimactic after the weighty hymnic language of the proem. Fakas uses it as evidence that Aratus' religious piety is insincere and that the opening can be read purely as exploitation of the tropes of archaic poetry, without the earnestness that marked the earlier works.<sup>285</sup> Perhaps because of its lack of religious injunctions and allusions to archaic epic, the epilogue has received relatively little scholarly attention.<sup>286</sup> However, I believe that the epilogue has far more thematic significance than previously recognized. Despite its obvious differences, the epilogue does have several connections to the proem. It covers many of the same themes, especially the ubiquity of signs and their relation to the passing year. The last line subtly recalls the first, with the repetition of “οὐδέποτε,” and, as has not previously been noted, an echo of the famous opening “ἐκ Διὸς” in “σχεδίως,” reinforced by the “αἰθέρι,” so that, *pace* Fakas, Zeus is present in the final line both in sound and in metonymy, even if

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<sup>285</sup> Fakas (2001), pp. 216-17.

<sup>286</sup> Fakas (2001), pp. 205-220, gives the most attention to the passage, but treats it as a problem that needs to be solved rather than a programmatic passage that helps to explain the poem as whole. Representative of most scholarship, Erren (1967), pp. 299-300, devotes less than two pages to it (compared to 22 pages, pp. 9-31, for the proem), most of which is only summary. Fantuzzi and Hunter (2004), p.225, acknowledges the last two lines as a “programmatic assertion of the poem’s usefulness,” but does not address the epilogue further.

his role is not emphasized.<sup>287</sup> It is clear that the epilogue is carefully crafted and should be read in conjunction with the proem.

Although both passages repeatedly stress the importance of signs, they do so with very different approaches. The proem focuses on the creation of signs by Zeus, explaining their origin and consequently establishing their immutability. The ending, however, consists mainly of a series of commands to the addressee to pay attention to signs, and to interpret them. Indeed, the final word of the poem, “τεκμήραιο,” underscores this.<sup>288</sup> The poem has switched from a focus on the formation of signs to their reception, but not as abruptly as a comparison of just the proem and epilogue suggests. Over the course of the poem, both the role of Zeus and that of the addressee change so that, by the end, the poem concentrates on its audience rather than its honorand.

At the beginning, Zeus is a central figure in the poem. After the proem, the first third of the poem contains 11 references to Zeus, always as the mythical deity and usually associated other mythological characters, such as Perseus or the Cretan Bears. Aratus reiterates his role in the creation of signs in the discussion of the Pleiades: “Zeus is the cause [i.e. that the Pleiades are famous], who sanctioned (ἐπένευσεν) for them to signal the beginning of summer and winter and the arrival of the seed-time.”<sup>289</sup> He gradually becomes a less present figure in the poem, however. The second third has only one

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<sup>287</sup> Fakas (2001), p. 216.

<sup>288</sup> *Phaen.* 1154.

<sup>289</sup> *Phaen.* 265-67.

reference to Zeus, but still as a mythical deity, with whom the Eagle constellation is associated.<sup>290</sup> The final third of the poem refers to him eight times, and he changes from anthropomorphic god into metonymy for the sky, as discussed above. The first four of these references use Zeus as a deity, not with mythological associations, but with meteorological and semiotic ones. He is still the god who gives signs, but Aratus emphasizes the human ability to recognize them more than Zeus' ability to create them. And the final four references to the god in the poem are all metaphors for the sky. As Fakas points out with amazement, this final reference to him in line 964 is two hundred lines before the poem ends!<sup>291</sup> Zeus has been transformed from god into natural phenomenon, and in the process, the focus on the poem has moved away from him.

In contrast, humans gradually acquire greater presence and importance in the *Phaenomena*. The idea is always present, and the very first constellations, the two Bears, are described in terms of how humans relate to them: Greeks sail by Helice, Phoenicians by Cynosura.<sup>292</sup> But the first third of the poem emphasizes the creation of the constellations, not their use. This section contains all but one of the catasterisms, and those of the Maiden (Dike) and the Horse are particularly prominent.<sup>293</sup> References to actually observing the constellations in the first third of the poem are few, and restricted to the relative brightness of particular stars.

As the poem progresses, however, human reception of signs begins to take precedence. The poem has three marked passages about humans looking at the sky and

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<sup>290</sup> *Phaen.*523.

<sup>291</sup> Fakas (2001), p. 214-15.

<sup>292</sup> *Phaen.*37-44.

<sup>293</sup> *Phaen.*96-136; 205-224.

deciphering the messages presented there. The first, which will be discussed in greater detail in the following section, details how the first human discovered the constellations.<sup>294</sup> It introduces into the poem the idea of humans exercising their own intellect to make sense of the signs in the natural world, but it still attributes the process to a nameless stranger, separated from the reader by vast stretch of time.

The second passage, the ‘Second Proem,’ celebrates the ubiquity of signs, and how it is important for us “ἄνθρωποι” to look for them.<sup>295</sup>

So master them [i.e. the constellations], and take care, if you ever trust in seafaring, to discover what signs presage stormy winds or a hurricane on the sea. It is no great exertion, but the constantly watchful man gains immeasurable benefit from his observation. First of all, he himself is safer, but also he can help someone else with good advice, when a storm swells nearby. For often someone will secure his ship on a calm night, fearing the early morning sea. Sometimes the storm strikes on the third day, and sometimes on the fifth, but sometimes it comes unforeseen. For not yet do we humans recognize everything from Zeus, but many things still lie hidden, which Zeus will quickly show, if he wishes. For he aids mankind manifestly, visible from everywhere, and revealing signs in every way.<sup>296</sup>

Τῷ κείνων πεπόνησο. Μέλοι δέ τοι, εἴ ποτε νηὶ  
πιστεύεις, εὐρεῖν ὅσα που κεχρημένα κεῖται  
σήματα χειμερίοις ἀνέμοις ἢ λαίλαπι πόντου.  
Μόχθος μὲν τ’ ὀλίγος, τὸ δὲ μυρίον αὐτίκ’ ὄνειαρ  
γίνετ’ ἐπιφροσύνης αἰεὶ πεφυλαγμένῳ ἀνδρί.  
Αὐτὸς μὲν τὰ πρῶτα σαώτερος, εὖ δὲ καὶ ἄλλον  
παρειπῶν ὤνησεν, ὅτ’ ἐγγύθεν ὄρορε χειμῶν.  
Πολλάκι γὰρ καὶ τίς κε γαληναίῃ ὑπὸ νυκτὶ  
νῆα περιστέλλοι πεφοβημένος ἤρι θαλάσσης·  
ἄλλοτε δὲ τρίτον ἡμᾶρ ἐπιτρέχει, ἄλλοτε πέμπτον,  
ἄλλοτε δ’ ἀπρόφατον κακὸν ἴκετο· πάντα γὰρ οὐπω  
ἐκ Διὸς ἄνθρωποι γινώσκομεν, ἀλλ’ ἔτι πολλὰ  
κέκρυπται, τῶν αἴ κε θέλη καὶ ἐσαυτίκα δώσει

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<sup>294</sup> *Phaen.* 367-85.

<sup>295</sup> The end of this passage is quoted above in the discussion of the acrostic.

<sup>296</sup> I accept Kidd’s explanation and translation of the nautical meaning of “περιστέλλω” in 766. Following Kidd, I have used “secure,” instead of the more literal ‘shorten sail.’ See Kidd (1997), p. 441, for more details.

Ζεύς· ὁ γὰρ οὖν γενεὴν ἀνδρῶν ἀναφανδὸν ὀφέλλει  
πάντοθεν εἰδόμενος, πάντα δ' ὅ γε σήματα φαίνων. (*Phaen.* 758-772)

This passage brings the interpretation of signs closer to home, as Aratus gives some instructions to the addressee himself, depicts a sailor (who is at least chronologically contemporary with the addressee) reading signs, and even uses the first person plural once.<sup>297</sup> Zeus' role merits a mention, but the passage focuses on humans.

The final passage, the epilogue, consists of twelve lines of specific instructions to the addressee on how to observe the sky. There is no explicit mention of Zeus, or of another observer beyond the addressee. He has read the poem and therefore he knows that Zeus created the constellations and earlier humans interpreted them, but there are still signs to recognize, and now it is his responsibility. The sign has travelled from its original creator to its ultimate receiver. The epilogue concludes the progression of the sign, and in this way, it brings the poem to its natural ending.

The *Phaenomena* uses its proem and its epilogue to encapsulate the entire 'life cycle' of a sign, from its creation to its reception and utilization. The proem of the *Phaenomena* is programmatic, thematically rich, and necessary to understanding the poem as a whole, but so is the epilogue. In it, Aratus concentrates on the reception of signs, which is more relevant for the reader, more under the poet's control, and, as the next section will demonstrate, also operates as guide to understanding the poem metapoetically.

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<sup>297</sup> *Phaen.* 769.

## V. Star Light, Star Bright

Now that the importance of the interpretation of signs within the poem has been established, I will explore how Aratus conceives of signs and how this pertains to his poetics. I will approach this issue from three different angles. First, I will place Aratus within the context of contemporary philosophical discussions, which will give some indication of how he thinks poetry and science are related. I will then look more specifically at the description of the creation of the constellations, the passage that comes closest to fully explaining how Aratus sees the human role in reading signs and how Aratus sees himself as a poet of signs. Finally, I will look at the recurring theme of the relative visibility and obscurity of different signs and how this connects to Aratus' relationship with his predecessors.

The nature of signs and their ability to provide information was a popular subject of philosophical debates in the third century, and Aratus' philosophical allegiances have been discussed frequently. As Gee mentions, modern scholarship has generally accepted the idea that Aratus' poem "gravitates towards Stoicism."<sup>298</sup> This is in spite of the fact that Aratus never makes any explicit reference to the school, or to any philosophical program at all. Cusset has recently suggested that any Stoicism in the work is dependent upon later readers rather than the text itself.<sup>299</sup> Cusset rightly underscores the problems of overly relying on apparent connections with Cleanthes' explicitly Stoic *Hymn to Zeus*

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<sup>298</sup> Gee (2013), p.4. Effe (1977) pp. 40-56, is the standard work on the Stoicism of the *Phaenomena*, although references to it can also be found in Erren (1967), pp. 22-27. Cusset (2011a), discussed below, is the most recent broach of the subject. See also Fantuzzi and Hunter (2004), pp. 226-27; Gee (2000), pp. 70-84; Kidd (1997), pp. 10-12; Jones (2003), pp.332-33. As a counterpoint, Kenney (1979), esp. pp.72-73, a review of Effe (1977), believes the connection to Stoicism has been overemphasized.

<sup>299</sup> Cusset (2011a).

and references in the *vitae* and scholia to Aratus' Stoicism, the two primary bases for this attribution.<sup>300</sup> Cusset's main point, that later readers believed Aratus to be Stoic and therefore specifically interpreted his text to conform to the school's positions, is valid and corresponds with established Stoic practices of finding tenets of their own philosophy in Homer and other archaic poets.<sup>301</sup> In fact, Stoicism this early in the third century was very fluid and may not yet have even developed a consensus on a number of issues related to natural philosophy.<sup>302</sup> Thus, there may not have been a dogmatic position for Aratus to embrace or reject.

Cusset does not attempt to trace the relationship of the poem and Stoicism beyond the opening, because, he claims "[I]e contenu astronomique et météorologique du poème qui suit ne trouve en effet pas beaucoup d'écho dans l'ancien stoïcisme, qui s'est assez peu intéressé, semble-t-il, à ces domaines scientifiques."<sup>303</sup> The idea that Stoics were not interested in astronomy is problematic in light of the extreme paucity of fragments from early Stoicism that survive on any subject at all.<sup>304</sup> His assertion about meteorology, however, is demonstrably untrue, because meteorology was closely linked to divination, a subject about which the Stoics were particularly interested.<sup>305</sup> There is perhaps even

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<sup>300</sup> On the comparison to Cleanthes' Hymn to Zeus, see James (1972).

<sup>301</sup> Cusset (2011a)

<sup>302</sup> Hunter (1995a), section 1, makes this point. See Sedley (2003), pp. 9-15, on the early school.

<sup>303</sup> Cusset (2011a), no pagination, paragraph 7.

<sup>304</sup> White (2010), p. 369. Jones (2003), pp. 328-332, claims Stoics mostly adopted a Eudoxan cosmology, which hardly contradicts an argument for Aratus' allegiance to the school.

<sup>305</sup> On Stoic divination, see Johnston (2008), pp.12-15; Long and Sedley (1987), pp. 259-66; 333-343. An important element of Stoic divination is astrology, which apparently Eudoxus explicitly rejected and Aratus never mentions, but it seems to have been introduced into the School in the late Hellenistic Period, possibly by Posidonius, see Jones (2003), pp. 337-42. On connections between meteorology and divination, see Taub (2003), pp. 67-69.



more reason to expect connections to Stoicism in the main body of the poem than in its programmatic opening, which has clear links to the poetic tradition.

Aratus' connection to this tradition involves more than just an interest in the same issues. Cicero's *De Divinatione* is our best source for Hellenistic theories about divination and the Stoic viewpoint is voiced by his brother, Quintus.<sup>306</sup> He explains the existence of signs in the natural world: "Indeed, always green, always weighed down is the mastich-tree, which is accustomed to grow with triple fruit, and bearing three fruits, shows the three times for ploughing."<sup>307</sup> Aratus describes this exact sign, and is likely the source of its use here, as it comes in an extended passage in which Quintus quotes other passages from (Marcus) Cicero's translation of Aratus' poem, because "ea, quae quamquam ex alio genere sunt, tamen divinationi sunt similia."<sup>308</sup> Aratus' meteorological signs have a place, for Cicero, in a discussion of divination and are especially connected with Stoicism.

Furthermore, Aratus' poem, as discussed above, is specifically preoccupied with signs as a larger concept, and this was a subject that was of particular interest across all philosophical schools in the Hellenistic period. Early Stoics appear to have embraced an especially practical appreciation of signs.<sup>309</sup> This is not to say that Stoics had no rigorous definition of signs, and Cicero's *De Divinatione* offers evidence that Chrysippus in

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<sup>306</sup> See especially Wardle (2007), pp. 8-14, on Quintus' role in the *De Divinatione*.

<sup>307</sup> Cic.*Div.*1.15: "iam vero semper viridis semperque gravata/ lentiscus triplici solita grandescere fetu/ ter fruges fundens tria tempora monstrat arandi." It should be noted that there is no scientific evidence that this is the case, and Jermyn (1951), on the authority of the Royal Botanical Gardens in Kew, has clarified that the mastich tree only blooms once a year, but that the confusion may have been caused by different species of mastich trees blooming at different times of the season.

<sup>308</sup> Cic.*Div.*1.13.

<sup>309</sup> See Allen, (2001) pp 161-67.

particular had a very engaged interest in logical syllogisms.<sup>310</sup> However, it seems that Stoics distinguished between a genus and a species of sign. The more specific term was defined as “an antecedent in a sound conditional revelatory of the consequent,” was used in enthymemes, and does not apply to the signs in the *Phaenomena*.<sup>311</sup> The larger category, however, included weaker, non-causal associations between things. Their conception of the sign was specifically geared for use in the practical arts, and especially divination.<sup>312</sup> Like Aratus, early Stoics were mostly unconcerned with the causation of signs, beyond the explanation of divine will.<sup>313</sup> In addition, Stoic semiology placed a high value on the role of ‘conjecture’ in these weaker forms of signs, that is, the human ability to recognize patterns through the course of long observation, patterns that allow someone to make predictions about the future from frequent previous notice of the co-occurrence of two separate events, regardless of any causal relationship between them.<sup>314</sup> This corresponds well with Aratus’ instructions to the addressee at the end of the poem. For Aratus, as for Quintus in Cicero’s *De Divinatione*, it does not matter *why* the mastich tree blooms at precisely the same time that the soil is particularly suited to be plowed, or that the harvest from that soil will match the fecundity of the tree, but simply that this conjunction of blooming and plowing has been observed for so long that we can use the tree’s behavior as a sign to predict the future. Aratus may not have been a Stoic, and the *Phaenomena* is not explicitly a poem about Stoicism, but his employment of signs

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<sup>310</sup> See Long and Sedley (1987), vol. I, pp. 183-230.

<sup>311</sup> Allen (2001), p. 149.

<sup>312</sup> It seems that philosophical interest in signs probably came out of their usefulness in these disciplines. See Manetti (1993).

<sup>313</sup> Allen (2001), p. 163

<sup>314</sup> Allen (2001), pp. 166-69.

suggests that his own ideas were informed by Stoicism, and this gives credence to the accounts in the *vitae* of his acquaintance with Zeno and Perseus.<sup>315</sup>

If Aratus was not affiliated with the Stoics, his semiology does not conform well to any other major philosophical school of the third century. His explicit attribution of divine interest in human affairs to Zeus obviates any need to consider a potential connection to Epicureanism.<sup>316</sup> Cusset has attempted to link Aratus to the Peripatetic school, because of the possible Aristotelian origin of the *De Signis*.<sup>317</sup> In fact, semiology became a fully-fledged discipline with Aristotle, in his discussions of logic.<sup>318</sup> However, Aratus' idea of signs has very little in common with the usage at the Lyceum.

Aristotelian signs are primarily defined by the truth-value of syllogisms in which they appear, and he makes a distinction between a token (τεκμήριον) and a sign (σημεῖον).<sup>319</sup> Tokens are used in 'demonstrations,' which have necessarily true premisses, whereas signs are used in weaker 'explanations,' which only have incidentally true premisses. For example, consider Syllogism I: 'If things that are near do not twinkle, and the planets are near, then the planets do not twinkle.' Because the proximity is the cause of the non-twinkling, this is a necessary premiss, and thus the syllogism meets the criteria of a demonstration. However, if the terms are rearranged to create Syllogism II, "If

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<sup>315</sup> Martin (1956), pp. 164-66.

<sup>316</sup> See Long and Sedley (1987), I, pp. 139-48.

<sup>317</sup> Cusset (2011a), paragraph 8. Cusset's argument rests on an Aristotelian authorship for the *De Signis*, rather than on any philosophical points in the poem that correlate with the ideas propagated by the Lyceum.

<sup>318</sup> On Aristotelian use of signs, see Manetti (1993), pp. 70-91; Barnouw (2002), pp. 49-148; and Allen (2001), pp. 13-86.

<sup>319</sup> Aristotle is not entirely consistent in his terminology throughout the corpus of his work, which has led Allen (2001), p. 62, following Solmsen (1929), pp. 27-31, to distinguish between a "*Topics*-oriented" definition and an "*Analytics*-oriented" definition of signs. It is beyond the scope of this section to describe the distinction, but the following is only an *Analytics*-oriented account. In this explanation, I am heavily reliant upon (and have adopted the terminology of) Allen (2001), pp. 72-78, which is an exegesis of *Anal.Post.1.13*.

things that are near do not twinkle, and the planets do not twinkle, then the planets are near,” this is still a sound conditional, but the non-twinkling does not cause the proximity (rather, it is caused *by* it), and so the syllogism does not qualify as a ‘demonstration.’ It is therefore defined as an ‘explanation.’ In Syllogism I, proximity is a ‘τεκμήριον’ for non-twinkling, whereas in Syllogism II, non-twinkling is a ‘σημείον’ for proximity. For Aristotle, the definition of a sign is directly connected to its function within logical syllogisms and the precise causative relationship between the sign and signified. Aratus’ explanation of the cause of signs is limited to divine beneficence, as stated in the proem and the Pleiades passage.<sup>320</sup> It is not simply that Aratus’ signs would not meet Aristotle’s logical criteria, but rather that his interest in signs resides in a fundamentally different question, how we observe and use them, as opposed to what causes them.

Thomas Benatouïl has defined Aratus’ signs using the terminology of commemorative and indicative signs.<sup>321</sup> These terms come from Sextus Empiricus’ important works *Against the Mathematicians* and *Outlines of Pyrrhonism*, and were an important element of Skeptic thought.<sup>322</sup> The Skeptics in the Academy based their ideas about signs on the possibility of confirmation. Signs, for Skeptics, can point to three types of information: knowable, temporarily unknowable, and always unknowable.<sup>323</sup> Commemorative signs point to information that falls into the first two categories, such as a scar as a sign of a previous wound (the wound would have been knowable, before it was replaced by a scar). Indicative signs point to information that is always unknowable,

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<sup>320</sup> *Phaen.* 5-13; 265-67.

<sup>321</sup> Benatouïl (2005).

<sup>322</sup> Benatouïl (2005), pp. 136-38.

<sup>323</sup> Allen (2001), pp. 106-122.

such as sweat, as a sign that skin is porous. The porosity of skin can never be observed directly (without a microscope), and so there can be no independent autopsy of the thing the sign putatively indicates. For this reason, Skeptics, or at least, Sextus Empiricus, our only source for this argument, tended to consider indicative signs invalid.<sup>324</sup> Although most of Aratus' signs would qualify as commemorative, because they mark things that would eventually be independently verifiable, such as weather phenomena, some are clearly indicative. He refers to the constellations as “σήματα” of the four invisible circles of the universe (the tropic of Cancer, the celestial equator, the tropic of Capricorn, and the ecliptic).<sup>325</sup> These must definitely be considered indicative signs, and therefore, Aratus clearly adopted a more catholic definition of the sign.

Benatouïl argues that the presence of indicative signs of the circles “révèlent l'existence des mécanismes qui lui produisent.”<sup>326</sup> His conclusion is reasonable, but this terminology is specifically Skeptic and was not used widely in other philosophical schools.<sup>327</sup> In fact, they may have grown out of a debate between Sceptics and Medical Empiricists, and only come into usage later than Aratus. This means that Benatouïl is attempting to define Aratus' signs using criteria that were probably not in use in the third century, and that, if they were, only had relevance for a school that would have rejected Aratus' definition of signs.

We can therefore rule out a connection to any other school. If Aratus was in contact with, and was influenced by, early Stoics, we may then consider how this may

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<sup>324</sup> Allen (2001), p. 87-89.

<sup>325</sup> *Phaen.*462-68.

<sup>326</sup> Benatouïl (2005), p. 138.

<sup>327</sup> This is demonstrated convincingly in Allen (2001), pp. 87-146.

have influenced his poetics. First of all, it seems that, in lieu of making direct causal links between the sign and the signified, Chrysippus often explained the relationship between the two by the use of etymology and mythology, tactics we have already seen Aratus employ.<sup>328</sup> In addition, the connection between meteorology and divination allows Aratus to play the role of a quasi-rationalized oracle, utilizing the poet/prophet connection in a scientific context. Stoic interest in early poetry, especially Homer and Hesiod, also may inform Aratus' interest in these particular poetic models.<sup>329</sup> Aratus, by adopting their language, also trades on the truth-value these poems had for Stoics. Aratus may even refer to Stoic scholarship on ancient poetry in his reference to “Διὸς...ὑποφῆται,” who connect the Goat constellation with the Olenian goat who nursed Zeus.<sup>330</sup>

The connection to Stoicism is too tenuous, however, to offer many specifics of how Aratus' semiology and his poetics were related; for this we must rely on the poet's own words. The passage that best explains how Aratus thinks humans should decipher the sky describes the first creator of the constellations:

There are stars, small in size and imbued with little brilliance, revolving between the Rudder and Cetus, crouching below the sides of the grey Hare, nameless. These are not fashioned like the limbs of a wrought image, like those many stars, lined up in order, that pass along on the same paths as the years go by, the ones some man—no longer living—devised (ἐφράσατ') and thought to call by name, shaping them compactly (ἤλιθα). He could not name these stars all individually, nor recognize (δαῖναι) them all, for they are numerous altogether, and many are similar in size and color, and indeed, all of them revolve. And so it seemed best to him for the stars to be made (ποιήσασθαι) into groups, so that one lying next to

<sup>328</sup> Allen (2001), pp. 164-65. See also O'Hara (1996), pp. 19-21, on Stoic etymology.

<sup>329</sup> On this subject, see Pfeiffer (1968), pp. 234-51; Struck (2004), pp 111-41; and as counterpoint, see Long (1992). We know from that Chrysippus wrote a commentary on Hesiod (see Struck (2004), p. 119), and their general interest in poetic scholarship may connect to Aratus' own, see Kidd (1997), p. 5.

<sup>330</sup> *Phaen.* 164.

another in order would signify shapes. And so the constellations (ἄστρα) were named, and now no longer does a star rise unexpected, but some appear, joined into clear images, whereas all the stars beneath the hunted Hare are borne along quite faint and without name.<sup>331</sup>

Οἱ δ' ὀλίγω μέτρῳ, ὀλίγη δ' ἐγκείμενοι αἴγλη  
 μεσσόθι πηδαλίου καὶ Κήτεος εἰλίσσονται,  
 γλαυκοῦ πεπτηῶτες ὑπὸ πλευρῆσι Λαγωῦ  
 νόνουμοι· οὐ γὰρ τοίγε τετυγμένου εἰδώλοιο  
 βεβλέαται μελέεσσιν ἐοικότες, οἷά τε πολλὰ  
 ἐξείης στιχόωντα παρέρχεται αὐτὰ κέλευθα  
 ἀνομένων ἐτέων, τὰ τις ἀνδρῶν οὐκέτ' ἐόντων  
 ἐφράσατ' ἢ δ' ἐνόησεν ἅπαντ' ὄνομαστί καλέσσαι  
 ἦλιθα μορφώσας· οὐ γὰρ κ' ἐδυνήσατο πάντων  
 οἰοθὶ κεκριμένων ὄνομ' εἶπέμεν οὐδὲ δαῖναι·  
 πολλοὶ γὰρ πάντη, πολέων δ' ἐπὶ ἴσα πέλονται  
 μέτρα τε καὶ χροίη, πάντες γε μὲν ἀμφιέλικτοι.  
 Τῷ καὶ ὀμηγερέας οἱ εἰείσατο ποιήσασθα  
 ἀστέρας, ὄφρ' ἐπιτάξῃ ἄλλῳ παρακείμενος ἄλλος  
 εἶδεα σημαίνοιεν. Ἄφαρ δ' ὄνομαστὰ γέγοντο  
 ἄστρα, καὶ οὐκέτι νῦν ὑπὸ θαύματι τέλλεται ἀστήρ,  
 ἀλλ' οἱ μὲν καθαροῖς ἐναρηρότες εἰδώλοισιν  
 φαίνονται, τὰ δ' ἔνερθε διωκομένοιο Λαγωῦ  
 πάντα μάλ' ἠερόντα καὶ οὐκ ὄνομαστὰ φέρονται. (*Phaen.*367-85)

As Kidd notes, the passage is structured chiasmically:

...in what is essentially one long sentence: (a) the stars beneath the Hare are nameless (367-70), (b) because they do not make a figure like the regular constellations (370-73), (c) which were formed by someone into groups of stars and named (373-75), (d) because it was impossible to identify stars individually, since they all look alike (375-8), (c) so he decided to arrange the stars in groups (379-81), (b) and thus we have the familiar constellations (381-82), (a) whereas the stars beneath the Hare are nameless (383-85).<sup>332</sup>

The chiasmatic shape of the passage highlights its importance, and especially of its central element, the impossibility of identifying these stars. The lack of brilliance and the

<sup>331</sup> In my translation, I have followed Kidd (1997), p. 321, in his translation of “ἦλιθα” (375), based on a scholia that suggests the meaning “compact” rather than “foolish,” and in line 382, I have used his general comments, pp. 168-69, on Aratus’ distinction between “ἄστρα,” to refer to constellations and “ἀστέρες” for the plural of individual stars. I have also used his translation of “ἐφράσατ’” (374) as ‘devised,’ which will be explained below.

<sup>332</sup> Kidd (1997), p.318. See also Erren (1958); Kidd (1967); Pendergraft (1990).

indeterminate shape of this southern cluster of stars is probably because of their proximity to the horizon for Northern Hemisphere dwellers. But Aratus' explanation for this blurring, the main point of the passage, is the limit of human knowledge. The passage manages to celebrate the human ability to make sense out of confusing things, while also pointing out the limitations of that capacity.

This mysterious person fits into the model of the *πρῶτος εὐρετής*, which was frequently employed for astronomical subjects in antiquity.<sup>333</sup> Aeschylus attributes the risings and setting of the stars to Prometheus, although a scholion suggests he elsewhere ascribed it to Palamedes, who perhaps also discovered the constellations (“οὐράνια τ’ σήματα”) in a play by Sophocles.<sup>334</sup> Plato leaves his version anonymous, just as Aratus has done, but Aratus probably does so to create symmetry with the unnamed stars, rather than because he is following Plato.<sup>335</sup> Whoever this culture hero actually is, his actions fall within the liminal space between discovery and invention. He cannot be said to have created the constellations, but he actively decides on the configurations and shapes. The discussion about his level of involvement in the creation of constellations has centered on the use of “φράζω” in 374, which Johann Heinrich Voss translated as “angemerkt,” and G.R. Mair as “noted,” both far more passive than Kidd’s “devised,” used above.<sup>336</sup> As Kidd notes in defense of his translation, the later repetition of the idea is marked by the verb *ποιέω* in 379, which connotes a creative aspect to his achievement. This is absent, as far as the evidence survives, in previous versions of the discovery. Aeschylus uses

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<sup>333</sup> See Kleingünther (1933). Fantuzzi and Hunter (2004), p. 228, see this passage in a tradition with Empedocles’ praise of Pythagoras and Lucretius’ praise of Epicurus.

<sup>334</sup> *A.Pr.* 457-8; *Σ Soph.fr.* 432.3 Radt. See also Kidd (1997), p.320

<sup>335</sup> *Pl.Cra.* 388d. .

<sup>336</sup> Voss (1824); Mair (1921); Martin (1998), p. 22, uses “*désigner*,” which similarly connotes a more active process. See Kidd (1997), p. 320.



“δείκνυμι,” and the scholion to the line characterizes it as a “εὐρησις,” both passive conceptions of the act, and Plato uses “παραδίδωμι,” which emphasizes the later transmission of the information rather than the discovery itself. Aratus’ εὐρετής, in contrast, actively discerns the patterns and picks the shapes they resemble to him. All of the constellations, according the *Phaenomena*, are human creations, even if the stars themselves are divine. The πρῶτος εὐρετής both interprets the signs in the stars and also constructs the constellations as signs of those stars for later generations, generating a chain of sign creation and reception.

The next link in this chain, as hinted at in the use of “ποιέω,” is Aratus himself. Aratus does not portray himself as a πρῶτος εὐρετής, and in fact, the narrator’s presence in the poem is practically nil. But the πρῶτος εὐρετής’ motivations can be mapped onto the poem as whole. The πρῶτος εὐρετής developed a system of patterns, linking them to well-known shapes, in order to make sense of the confusing chaos of the sky, developing, in essence, an educational guide and a mnemonic device. Aratus in turn spins patterns between the constellations, connecting them to famous myths and other poetic tropes to demystify them (such as the Perseus constellations, discussed above). The *Phaenomena* itself is a second-order constellation, weaving all the constellations (as well as other signs in the universe) into a coherent whole. The chain of sign transmission moves from Zeus to the πρῶτος εὐρετής, from the πρῶτος εὐρετής to Aratus, from Aratus to the reader. In each case, the person receiving the signs operates in fundamentally the same way, recognizing patterns and then passing these on.<sup>337</sup> Aratus’ poetry is a form of sign

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<sup>337</sup> Danielewicz (2005), p. 325, remarks on the similarities between the practices of the πρῶτος εὐρετής and the addressee. Volk (2012) sees Aratus patterning himself after Zeus.

interpretation as much as it as form of sign transmission. This passage, which demonstrates how a human can read the signs of the universe, also shows the poet's role. Poetry is a way of making sense of a confusing and unwieldy body of information.

This chain of transmission is reflected in the way verbs 'travel' from Zeus and the Muses to the addressee. In the proem, Zeus is the subject of "ἐσκέψατο," but in the epilogue it is the addressee described as "ἐσκεμμένος."<sup>338</sup> Similarly, the Muses are invited to "τεκμήρατε πᾶσαν ἀοιδίην," in the beginning, and at the end, the student is instructed: "ἐπ' αἰθέρι τεκμήραιο."<sup>339</sup> This highlights the progress the student has made over the course of the poem.

The faintness of the stars between the Argo and Cetus provides the impetus for the passage about the πρῶτος εὐρετής. This emphasis on the level of brilliance of stars recurs throughout the astronomical sections and appears to be a particularly Aratean interest, as mentioned in the introduction of this chapter.<sup>340</sup> Eudoxus' account of the Cepheus group reads:

Below the tail of the Little Bear, Cepheus has his feet, making an equilateral triangle with the tip of her tail. His middle is near the bend of the Snake between the Bears. In front of Cepheus is Cassiopeia, and in front of her is Andromeda, whose left shoulder is over the more northerly of the Fish; her drapery is above the Ram, to disregard the Triangle, which is between. A star in her head doubles as one of the belly of the Horse. Perseus has his shoulders by the feet of Andromeda and extends his right hand toward Cassiopeia and his left knee toward the Pleiades. Below Perseus and Cassiopeia, not very far distant, is the head of the Great Bear. The stars between them are faint.<sup>341</sup>

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<sup>338</sup> *Phaen.*11;1153. See fn. 283 on the meaning of σκέπτομαι.

<sup>339</sup> *Phaen.*18; 1154.

<sup>340</sup> See Lewis (2010) on these words in Latin translations of Aratus.

<sup>341</sup> This is the translation, provided by Pendergraft (1982), p. 15, whom I follow in considering this a continuous passage, even though it is quoted *passim* in Hipparchus' commentary. For the actual fragments, Pendergraft (1982), p. 11.

All of this information is provided in Aratus' more artful version, which, as discussed above, uses mythological, linguistic, and visual echoes to create connections between these constellations. Aratus also stresses the brightness of “νυκτι φαεινομένη παμμήνιδι Κασσιόπεια,” and her daughter, who is immediately visible in night sky; the horse, whose sides and shoulders are marked by stars “καλοὶ καὶ μεγάλοι,” but whose head is faint; and the Ram, “νωθῆς καὶ ἀνάστερος.”<sup>342</sup> Eudoxus cares primarily about the placement and the relative position of constellations, whereas Aratus' version focalizes through the observer, and offers more details about the factors that control our ability to recognize constellations.

The Cepheus group example was provided for demonstration, but Aratus mentions the ease or difficulty of observation for almost every constellation. This conforms well to the poem's focus on the observer and his abilities of sign recognition. The importance of the relative brightness of constellations is not just practical, however, but also metapoetic, as signaled in the very first constellations of the poem, the Bears:

They call the one Cynosura and the other Helice. The Achaian men mark where they must lead their ships in the sea by Helice, whereas the Phoenicians cross the sea relying on the other. But Helice is clear and easy to recognize, shining brightly from the beginning of the night, and the other is small, yet better for sailors, for she turns about in a smaller orbit. And by her, the Sidonians sail straighter.

Καὶ τὴν μὲν Κυνόσουραν ἐπὶ κλησὶν καλέουσιν,  
τὴν δ' ἑτέραν Ἑλίκην. Ἑλίκη γε μὲν ἄνδρες Ἀχαιοὶ  
εἶν' ἀλλ' ἰσχυροὶ τεκμαίρονται ἵνα χρεὶ νῆας ἀγνεῖν·  
τῇ δ' ἄρα Φοίνικες πίσυνοι περὶ ὄωσι θάλασσαν.  
Ἄλλ' ἢ μὲν καθαρὴ καὶ ἐπιφράσσασθαι ἐτοίμη  
πολλὴ φαεινομένη Ἑλίκη πρώτης ἀπὸ νυκτός·  
ἢ δ' ἑτέρα ὀλίγη μὲν, ἀτὰρ ναύτησιν ἀρείων·  
μειοτέρη γὰρ πᾶσα περιστρέφεται στροφάλλιγγι·

<sup>342</sup> *Phaen.* 189; 198-99; 210; 228.

τῆ καὶ Σιδόνιοι ἰθύντατα ναυτίλλονται. (*Phaen.* 36-44)

For Aratus, just because a sign is easily visible doesn't make it more reliable, but nevertheless highly conspicuous signs are still useful, because they are available to a wider audience and can help locate the more obscure ones. At the end of the epilogue, he celebrates the utility of more visible signs, recommending to the addressee that, "It would be very helpful to consider the four days at the end and beginning of the month. For these days hold together the limits of the converging months, when the sky is more uncertain for eight nights, because of the absence of the bright moon."<sup>343</sup> That is, the bright moon offers the most reliable signs, and its absence leads to less secure predictions. The epilogue clarifies, however, that it is the quantity of signs, rather than the quality that matters most: "It is good to look at one sign next to another. Hope should arise when two point to the same thing, and with a third, you may take courage."<sup>344</sup> Aratus' interest in the relative visibility of signs does not then stem from a belief that it relates to how much we should trust them, but to our experience observing them.

The metapoetic significance of the relative brightness of the Bears is dependent upon its relation to other, similar passages in the poem. Before this practical guide to the use of the two constellations, Aratus provides their mythological origin as the bears who guarded Zeus in the cave on Crete.<sup>345</sup> This is the first of a handful of mythical catasterisms in the poem: the Bears, Ariadne's Crown, Dike, the Horse, the Lyre, and

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<sup>343</sup> *Phaen.*1048-52: "μάλα δ' ἄρκιον εἶη/ φράζεσθαι φθίνοντος ἐφισταμένοιο τε μηνὸς/ τετράδας ἀμφοτέρως· αἱ γὰρ τ' ἄμυδις συνιόντων/ μηνῶν πείρατ' ἔχουσιν, ὅτε σφαλερώτερος αἰθὴρ/ ὀκτῶ νυξὶ πέλει χήτει χαροποῖο σελήνης."

<sup>344</sup> *Phaen.*1142-44: "καλὸν δ' ἐπὶ σήματι σήμα/ σκέπτεσθαι· μᾶλλον δὲ δυεῖν εἰς ταῦτόν ἰόντων/ ἔλπωρὴ τελέθει· τριτάτῳ δὲ κε θαρσύνεισθαι."

<sup>345</sup> *Phaen.*30-35.

Orion, all of which have some association with poetry.<sup>346</sup> Ariadne's Crown and the Lyre are both short references to famous myths, but the Dike catasterism and the Horse, both longer passages, have much more bearing on our understanding of the Bears.<sup>347</sup>

Dike "sings" her instructions to men in the Golden Age, a clear reference to didactic poetry.<sup>348</sup> The passage does not just mark its genre, however, but also comments on it, and Hesiod is not the only didactic poet present. Gee has recently argued that Empedocles is as present a figure in this passage as Hesiod. In his own *Myth of Ages*, Aratus employs not only Hesiod's linear time marked by the progressive ages, but also Empedocles' cyclical alternation between Love and Strife.<sup>349</sup> Furthermore, the Silver Age section contains the only speech in the entire poem, which may hold a connection to Parmenides as well. Most of Parmenides' poem, as far as can be determined from the surviving fragments, narrated a lengthy speech, delivered by a female goddess, possibly Dike.<sup>350</sup> Parmenides' philosophy, which denied the existence of change and had a radically different definition of the word φαινόμενα, was probably too far afield to be incorporated into Aratus' poem, but the later poet pays tribute to Parmenides' formal

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<sup>346</sup> *Phaen.* 30-35 (the Bears); 71-73 (the Crown); 98-136 (the Maiden); 216-224 (the Horse); 268-71 (the Lyre); 637-46 (Orion). Erren (1967), p.32, develops a list of mythological references in the astronomical section, totaling 12, and including many, such as the Olenian Goat (163), that I have excluded from my list because the specific catasterism is not narrated. He argues that references to other deities in these passages are allegories for Zeus, such as Helios for Zeus in the River passage (p. 33-34), or related Stoic concepts, such as Hermes as a symbol of logos in the Lyre passage (p.35).

<sup>347</sup> The connection of the Lyre with poetry is obvious, although it should be noted that Aratus associates the Lyre with Hermes, not Apollo. I am treating the reference to Dionysus in the Crown passage as poetic. Other than the Orion catasterism, these passages all come relatively close to one another. Orion's story, equal in length to the Horse, comes in the *paranatellonta*, about 300 lines after the Lyre. I am not discussing it here because of its slightly separate status, but it may also have some poetic relevance, since Aratus specifically mentions that the story takes place on Chios (638).

<sup>348</sup> *Phaen.* 107.

<sup>349</sup> Gee (2013), pp.29-33.

<sup>350</sup> *Parm.Fr.* 1.14. Popper (1992) and Morrison (1955) have used this fragment as evidence that the speaker is Dike, but it is not explicitly clear in the fragments. Other suggestions have been Mnemosyne and Truth, see Slaveva-Griffin, p. 238, n. 42.

innovations to the genre.<sup>351</sup> The passage then represents not just a meditation on humanity's past, but also on Aratus' poetic predecessors. His final line about the constellation is that, "even still she shines all night for mankind, near far-seen Bootes."<sup>352</sup> Dike, as a sign of that tradition of didactic poetry, is very visible.

The Horse passage also addresses Aratus' relationship with one of his most important predecessors, Hesiod:

That one they say brought down from lofty Helicon the lovely water of fragrant Hippocrene. For not yet was the peak of Helicon dripping with springs, but then the Horse struck it, and all the water poured out from that spot at the blow of the first foot. And the first shepherds made famous the Hippocrene spring. But it trickled out of the rock, and so it was not seen far from the men of Thespis. But this Horse revolves in the realm of Zeus and you may see it next to him.

Κεῖνον δὴ καὶ φασὶ καθ' ὑψηλοῦ Ἑλικῶνος  
καλὸν ὕδωρ ἀγαγεῖν εὐαλδέος Ἴππουκρήνης.  
Οὐ γάρ πω Ἑλικῶν ἄκρος κατελείβετο πηγαῖς·  
ἀλλ' Ἴππος μιν ἔτυψε· τὸ δ' ἀθρόον αὐτόθεν ὕδωρ  
ἐξέχυτο πληγῆ προτέρου ποδός· οἱ δὲ νομῆες  
πρῶτοι κεῖνο ποτὸν διεφήμισαν Ἴππουκρήνην.  
Ἀλλὰ τὸ μὲν πέτρης ἀπολείβεται, οὐδέ τοι αὐτὸ  
Θεσπίων ἀνδρῶν ἐκάς ὄψαι· αὐτὰρ ὄγ' Ἴππος  
ἐν Διὸς εἰλεῖται, καὶ τοι πάρα θηήσασθαι. (*Phaen.*216-224)

This passage gives the most unambiguously metapoetic reference to Aratus' connection to Hesiod, and it indicates that his relationship with the earlier poet involves not just *imitatio* but also *aemulatio*. Like the Dike passage, it ends with a prominent reference to the visibility of the constellation, but this time, the visibility of the constellation has specific metapoetic significance (and more cheek!), as the Horse is more visible in the

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<sup>351</sup> On Parmenides' philosophy, see Kirk, Raven, Schofield (1995), pp. 242-62, esp. pp. 249-53, on the unchanging nature of reality, which conflicts, at the very least, with Aratus' catasterisms. Gee (2013), pp. 7-17, explores some of the nuances of the word 'φανόμενα' and its bearing on the meaning of the poem.

<sup>352</sup> *Phaen.*135-36.

sky than the Hippocrene spring. Moreover, the passage demonstrates that, like many other Hellenistic poets, Aratus uses water as a metaphor for poetry.

These two prominent catasterisms create a context within which to read the description of the Bears and their relative brightness.<sup>353</sup> First, the brightness itself connects directly to poetic fame, and, secondly, water also has metapoetic significance, even if the poem predates Callimachus' popularization of that metaphor.<sup>354</sup> These factors suggest that the Bears' brightness and their application for sailing also says something about Aratus' poetry. Furthermore, the Bears are almost didactic figures, as Aratus stresses their role in raising Zeus: “Δίκητη ἐν εὐώδει, ὄρεος σχεδὸν Ἰδαίοιο/ ἄνθρωποι ἐγκατέθεντο καὶ ἔτρεφον εἰς ἐνιαυτόν.”<sup>355</sup> Aratus offers us two models of teaching. One is popular with the Greeks, widely accessible but less strictly precise, and, coincidentally, has a name close to that of Mount Helicon. The other is more difficult, harder to access, but is utilized by technically proficient Phoenician sailors.<sup>356</sup> The descriptions of these two constellations correlate closely with the two traditions of didactic literature that Aratus combines, didactic poetry and technical prose, one that can be more easily understood and one that can offer more precise information and better guidance.<sup>357</sup>

Aratus sails his own ship between these two traditions, navigating between precision and

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<sup>353</sup> Orion's visibility is also stressed, or rather, the fact that the Scorpion defeats him by being more “προφανής.” (l. 644).

<sup>354</sup> On Callimachus' metapoetic use of water imagery, see Cameron (1995), pp. 363-66; Bundy (1972); Traill (1998); Williams (1978), p.88; Poliakoff (1980); Gutzwiller (2007), p. 72.

<sup>355</sup> *Phaen.*33-34.

<sup>356</sup> If a particular figure should be attached to this mode of teaching, Thales is the best candidate. As recounted in Call. fr.191. 52-55 (D.L.1.23), Thales first taught the Phoenicians to sail by Ursa Minor. See Kerkhecker (1999), p. 39; Kirk, Raven, Schofield (1995), p. 87. It is difficult to pinpoint the relative chronology between these two passages (Acosta-Hughes (2002), p.4, will only go so far as to say the *Iamboi*, from which this comes, were composed after the *Aetia*), it seems mostly that Callimachus is following Aratus, as Kidd (1997), p. 37, believes. This would mean Callimachus is glossing Aratus' reference, and it suggests he read the passage metapoetically, as I have.

<sup>357</sup> See Fantuzzi and Hunter (2004), p.235; Hutchinson (2009) on the wider audience of poetry.

ease of understanding. The running commentary on the visibility of different stars throughout the poem is, in part, a manifestation of Aratus' greater interest in the experience of the observer, but it also reflects the importance of the presentation the material, of straddling the line between the comprehension of the reader and faithful adherence to precision in presenting a complicated subject.

Aratus' interest in the interpretation of signs is part of his larger didactic program. The *Phaenomena* is not a poem about the stars and the weather; it is a poem about observing and understanding the stars and the weather, and throughout the poem, Aratus stresses the human experience of observation and sign-inference. The theme of interpretation reinforces the scientific theory of the poem, its larger poetic significance, and the didactic program as well. Aratus' connection to Stoicism, suggested by his practical, less abstract understanding of signs, stresses the employment of all connections, including mythical and etymological, regardless of causation. The passage on the creation of the constellations provides insights into Aratus' idea of his own role, as another link in the chain of people who read signs and interpret them for others. Finally, the repeated references to the visibility of signs highlight his mediation between accessibility and precision in his poetry.

## **VI. Conclusion: Ἐγκύκλιος Παιδεία**

From the readings in the previous section, it is clear that Aratus has a particular interest in the experience of the reader, in both his poetics and his theory of signs. Discussions of Aratus' poetics have focused on his relation to Callimachean aesthetics, but the emphasis



on the accessibility of poetry is an equally important feature of Aratus' style.<sup>358</sup>

Similarly, Aratus' interest in the constellations and the weather stresses the relative ease of observation and recognition. This conforms to the didacticism of the *Phaenomena*. In both of these areas, the aspects that are most pertinent for learning and education are given great emphasis. For this reason, I will conclude by considering how the relationship between science and poetry relates to the didacticism of the work.

Teaching and learning come up frequently in the *Phaenomena*, although the most famous instance, the praeteritio of the planets, does not suggest that the poet is a particularly skilled instructor.<sup>359</sup> He acknowledges that, “οὐδ’ ἔτι θαρσαλέος κείνων ἐγώ,” as justification for omitting the planets.<sup>360</sup> The student, at the end of the poem, should feel ‘confident’ in his knowledge of the rest of poem: when accumulating signs, Aratus tells us, you can be hopeful when two coincide, but with three, “θαρσήσειας.”<sup>361</sup> At the very end of the poem, Aratus deliberately recalls his own weakness as a teacher, as a means of demonstrating the progress of the student.

This student is putatively the addressee, a figure only slightly less shadowy than the narrator in the poem.<sup>362</sup> The addressee is hardly present at all in the

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<sup>358</sup> See Kidd (1997), pp. 34-36; Volk (2010), p. 199. This has also shaped the arguments about the significance of “λεπτή” in the acrostic, see fn. 216. See Cameron (1995), pp. 323-38, on the problematic nature of integrating λεπτότης into Callimachus' aesthetics.

<sup>359</sup> See Ludwig (1963), p. 439, on this passage and its place in the tradition of *recusatio*.

<sup>360</sup> *Phaen.*460.

<sup>361</sup> *Phaen.*1144.

<sup>362</sup> Nowhere in the poem is this addressee more present than in ending. In fact, Aratus gives us very little information about the recipient of his injunctions, other than the second person verb forms that he sprinkles throughout the poem. This is particularly marked in comparison with almost all didactic poetry before (and after) Aratus, which contains a named addressee. Schiesaro (1996) believes the beneficiary to be Antigonos Gonatus, and that seems the most likely individual, on historical grounds, but little in the text suggests he is the recipient. Fakas (2001), pp.94-99, has shown that whoever he is, he is probably not a farmer or a sailor, given that references to these actions are always given in the third person. See also Semanoff (2006) on the teacher-student relationship

beginning of the poem, but his abilities come into play in a particularly moving passage about the Milky Way:

If ever on a clear night, when heavenly Night shows off the brilliant stars to men, and none are made faint from the mid-month moon, but they all shine out sharply through the dark, if ever then awe comes to your mind while looking at the heavens split wholly by a wide circle, or if someone else standing next to you pointed out that wheel spotted all over with eyes (περιγληνές), they call it Milky (Γάλα).

Εἴ ποτέ τοι νυκτὸς καθαρῆς, ὅτε πάντα ἀγαυοὺς  
ἀστέρας ἀνθρώποις ἐπιδείκνυται οὐρανίη Νύξ,  
οὐδέ τις ἀδρανέων φέρεται διχόμηνη σελήνη,  
ἀλλὰ τάγε κνέφαος διαφαίνεται ὀξέα πάντα,  
εἴ ποτέ τοι τῆμόσδε περὶ φρένας ἴκετο θαῦμα  
σκεψαμένῳ πάντη κεκεασμένον εὐρέϊ κύκλῳ  
οὐρανόν, ἧ καί τις τοι ἐπιστὰς ἄλλος ἔδειξεν  
κεῖνο περιγληνές τροχαλόν, Γάλα μιν καλέουσιν. (*Phaen.*469-76)

The addressee is here first given agency in recognizing the heavenly bodies, positioned in a liminal stage between being able to identify constellations on his own and needing a guide to point them out to him. Afterwards, he gains greater presence, as Aratus uses more second-person imperatives, which culminate in the epilogue as a series of final injunctions to him.

Also noteworthy in the Milky Way passage is the presence of an actual teacher, someone doing in person what Aratus does on paper. This is one of many small allusions to teaching and *paideia* in the *Phaenomena*.<sup>363</sup> Both the Bears and the Goat are specifically

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<sup>363</sup> Semanoff (2006) reads perhaps too much into the references to the narrator and addressee in the poem, attempting to construct a persona for the narrator as a Stoic sage. He reads expressions about the ease of spotting constellations, such as Ursa Major, p.309, for example, as “expressing confidence in the student’s intellect,” when in fact the implication seems rather the opposite: the stars are so bright, any ignoramus can see them. This is more explicit in the description of Orion: “Whoever, glancing up on a clear night, overlooks that one, may trust he will not see anything clearer while gazing up at the heavens.” “Μὴ κείνον ὅτις καθαρῆ ἐνὶ νυκτὶ ὑψοῦ πεπηῶτα παρέρχεται, ἀλλὰ πεποίθοι/ οὐρανὸν εἰσανιδῶν προφερέστερα θηήσεσθαι.” (323-25).

described by their role in raising Zeus.<sup>364</sup> In the passage on the ubiquity of signs, it is not just the sailor's capacity to protect himself from storms that the poet celebrates, but also “εἶ δὲ καὶ ἄλλον παρεῖπὼν ὤνησεν.”<sup>365</sup> Aratus also uses figurative language implying agency to the celestial bodies in conveying information; the moon “teaches” its signs to us.<sup>366</sup> And finally, there is the *πρῶτος εὐρετής*, the original teacher of the constellations. These references all play on the larger theme of education and its relevance to the poem.

Central to Aratus' conception of didactic poetry is the marriage of science and verse. Form and content converge to contribute to the pedagogic goals of the *Phaenomena*. Poetic artistry breaks up the drier technical passages, but also provides deeper meaning to them. Scientific ideas also offer insights into Aratus' poetics. The figure at the center of the work is the student, the person seeking to understand the universe and the poetry about it. In the Hellenistic period, the idea of *ἐγκύκλιος παιδεία* gained great popularity, and Aratus' conception of education that embraces both the scientific and the literary fits well with this trend.<sup>367</sup> In light of Aratus' fondness for wordplay, the *Phaenomena* almost seems like an elaborate pun on the most literally ‘well-rounded’ education possible.

Aratus' relationship to both science and poetry is in service to his pedagogic larger goals. His goal is to use both to teach the reader about signs, and given the way later poets use their own signs to connect to him, he seems to have been successful.

Despite his importance as an innovator in generic matters, however, Aratus was less

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<sup>364</sup> *Phaen.* 31-35; 163-64.

<sup>365</sup> The passage on the ubiquity of signs is *Phaen.* 758-772, quotation is from 763-64.

<sup>366</sup> *Phaen.* 734; 93.

<sup>367</sup> The term seems to have been used by early Stoics, especially Zeno and Chrysippus, see *SVF* fr. 259; 224, respectively. See Marrou (1956), pp. 176-79, on Hellenistic education.

cutting-edge in the astronomical information he presented. Eudoxus' texts were already a century old when Aratus composed the *Phaenomena*. Moreover, with his omission of the planets, Aratus avoids any controversial material. In contrast, I will next look at how Apollonius uses the *Argonautica* to make an argument in an ongoing debate, the role of Homer in the study of geography.

## CHAPTER 2: ALEXANDRIAN SCHOLARS AND THE PROBLEM OF HOMERIC GEOGRAPHY

### I. Introduction

Aratus' poem avoided the most contentious subject in astronomy, that of planetary motion, and focused on the locations of the constellations, a much less controversial subject. Apollonius of Rhodes, in contrast, was only too happy to wade into the hotly-contested subject of Homeric geography, and to state implicitly his own opinions. This chapter will consider debates about the relationship between archaic poetry and geography in the Library of Alexandria, focusing on how Apollonius of Rhodes' *Argonautica* is in dialog with the geographical works of Eratosthenes of Cyrene in the latter half of the third century BCE, when Apollonius and Eratosthenes served sequentially as Head Librarian under Ptolemy II and Ptolemy III.<sup>368</sup> These debates

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<sup>368</sup> The chronology of the figures under discussion in this chapter is one of the most uncertain issues faced in this dissertation. That Apollonius postdates Callimachus (and Aratus) is relatively widely accepted, but how Theocritus' dates compare with those of the other Alexandrian poets is a source of contention: see Köhnken (2001). Fortunately, this debate is not especially relevant to this chapter, as my focus will be on Apollonius' relationship with Eratosthenes of Cyrene, rather than with the other Alexandrian poets. According to the most widely accepted timeline, Apollonius was succeeded by Eratosthenes as Head Librarian in c.246 BCE. This date is based on *P.Oxy* X 1241, first published in Grenfell and Hunt (1914), which was lauded a major breakthrough in Hellenistic chronology because it provided a list of the Head Librarians in Alexandria, and most of the other evidence, such as the Suda, was so much later. The Suda, in fact, reverses the order and claims that Apollonius succeeded Eratosthenes. Recently, however, Murray (2012) has argued convincingly that too much trust has been placed in this piece of evidence merely because it is attested in a papyrus fragment, which she believes comes from a 2<sup>nd</sup> century CE work by a figure who does not understand Hellenistic chronology very well. In fact, she points out that in all instances where the chronology can be checked, the author seems to have got it wrong. Murray rightly withholds from making any strong declarations about an alternative chronology, or adopting the order given in the Suda, as that evidence is hardly more trustworthy. This leaves the situation in a somewhat aporetic state, as there is no good evidence suggesting one author was earlier than the other. For this reason, I have decided not to base my argument on the relative chronology between the figures, but rather to see them as 'in dialog with one another.' In any case, the exact dates of their tenure as Head Librarian does not reflect their entire careers or their interaction with one another. Apollonius, before he was named to the position, was already affiliated with the Mousaion, and so if Eratosthenes preceded him, Apollonius would be familiar with Eratosthenes' geographical work. If, conversely, Eratosthenes came to Alexandria to replace Apollonius, surely he was brought because the Ptolemies were familiar with his work, as Geus (2002), pp. 26-30, argues. Either way, it seems safe to assume that each author knew of the other's work,

addressed the problem of how trustworthy Homer was as a geographical source. I will argue that Apollonius was actively engaged in the debates of the 3rd century to define geography as a discipline, and that he used the *Argonautica* to this end. Apollonius adopts Aratus' use of signs as a way of addressing the relationship between past and present, and the historicity of the voyages depicted in archaic epic, in service of his claims about how to geographical poetry.

Apollonius spent most of his life in Alexandria, immersed in the intellectual community at the Mouseion and the Library.<sup>369</sup> The Mouseion, populated by a small group of well-read people who cared passionately about the texts they studied, was not short on scholarly controversies.<sup>370</sup> Most of these are only available to us now in the quotations of later authors. One of the best attested is this central question of the relationship between poetry and geography, and specifically how a geographer ought to use Homer as a source.

The *Argonautica* is a narrative epic, which makes it very different from Aratus' *Phaenomena* and Nicander's *Theriaca* and *Alexipharmaca*. Apollonius takes pains, however, to demonstrate his connection to Aratus in a way that suggests that his own epic has larger goals for the geographical information within. The influence of Aratus on Apollonius has not been discussed in very great detail, but it is clear that Apollonius had

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even if the precise chronology of the composition of the *Argonautica* and the *Geographika* cannot be determined.

<sup>369</sup> On Apollonius' biography, see Lefkowitz (2008).

<sup>370</sup> The most famous is of course the rivalry between Callimachus and Apollonius, which Pfeiffer (1968), pp. 142-44, accepts it as fact, but most scholars now hold the story as dubious at best, see Lefkowitz (2008), pp. 61-63; DeForest (1994), p. 2, n.6. On the Alexandrian poets and scholarship, see Cusset (1999).

read the *Phaenomena* from his numerous allusions to the poem he includes.<sup>371</sup>

Apollonius' Aratean references highlight his own use of signs and their value as a form of proof for the truth of his words.

In this chapter, I will first show that geography was a problematic discipline, diffuse and poorly-defined, and that many writers, such as Strabo, Hipparchus, and Eratosthenes, sought to limit the definition of the field in various ways. Eratosthenes' particular attempt divorces the study from poetic sources, and most especially from Homer and Homeric scholarship. I will argue that Apollonius' *Argonautica* also contributes to the discussion that of how to define geography and that he offers demonstration of the viability of Homeric geography within the field. Finally, I will consider the ways in which Apollonius' interest in geography has a direct bearing on his relationship with Homer as both a poetic and a geographical model.

## **II. In the Shadow of Eratosthenes: Defining Geography in the Hellenistic Period**

In this section, I will attempt to situate Eratosthenes' *Geographika* within the context of geographical writing as a discipline.<sup>372</sup> Before doing so, it is necessary to give some account of what exactly geography was in antiquity. This is a far more difficult task than it might at first appear. Even the term itself is ambiguous. Consider Strabo's use of the verb γεωγραφέω: "For the most part, the sea marks the boundaries (γεωγραφεί) and gives

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<sup>371</sup> Kidd (1997), *passim*; Mooney (1912), p. 24.

<sup>372</sup> Surveys of the history of geography have been popular since early in Classical scholarship, see Bunbury (1879), Berger (1903), Warmington (1934), Thomson (1948). More recently, the work of Romm (1992), Nicolet (1990), and Hübner et al. (2000) offer good overviews of the subject. On the issue of Hellenistic geographical work specifically, Fraser (1972), pp. 520-53; Fraser (1971) and Meyer (1998).

shape to the earth, by forming bays and seas and straits, as well as isthmuses, peninsulas, and headlands.”<sup>373</sup> Geography is, in this sense, the delimiting of the boundaries, the actual process of defining the topography of the earth. And yet, as a discipline, it has the most amorphous boundaries, spilling into almost every other type of study that was conducted in antiquity. As Nicolet states, “nearly all literature is open to a geographic reading.”<sup>374</sup> In this section, I will argue that Eratosthenes shapes the later discussion with his argument against using Homer as a source, an argument gets bound up in the related but distinct question of the value of poetry. I will then consider how Eratosthenes’ views on the subject are determined by his own interest in the definition of geography.

Many modern scholars view Eratosthenes as the first geographer.<sup>375</sup> He may have been the first to use the term ‘γεωγράφος,’ although the term is used in a fragment of Philodemus, separated by a lacuna from a quotation of the 4<sup>th</sup> century writer Heraclides of Pontus, who should therefore be considered an equally likely candidate.<sup>376</sup> The emphasis on Eratosthenes’ role in creating the discipline has been perhaps slightly over-emphasized. Strabo writes that, “he [Eratosthenes] himself said that the study of the *oikoumene* advanced with respect to knowledge, because of the men after Alexander and

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<sup>373</sup> Str.2.5.17: “Πλεῖστον δ’ ἡ θάλαττα γεωγραφεῖ καὶ σχηματίζει τὴν γῆν, κόλπους ἀπεργαζομένη καὶ πελάγη καὶ πορθμούς, ὁμοίως δὲ ἰσθμούς καὶ χειρρονήσους καὶ ἄκρας.”

<sup>374</sup> Nicolet (1990), p. 8. See also Romm (1992), p.7.

<sup>375</sup> Roller (2010), p. 7; Compare Romm (1992), pp. 9-10, who sees geography as a discipline already fully formed by the time Eratosthenes is writing.

<sup>376</sup> The precise term Eratosthenes used in the title of his work varies in the testimonia, between γεωγραφικά, γεωγραφούμενα, and γεωγραφία, see Romm (1992), p. 9, n. 2; van Paasen (1957), p. 34. I refer to the work as the *Geographika* throughout, for the sake of simplicity, and to distinguish it from Strabo’s work, which I refer to as the *Geography*. On the issue of Eratosthenes’ role in coining the term, Roller (2010), p. 1, n.1, dismisses the possibility that Heraclides might have done so, because he “seems too early,” but this is not a particularly convincing argument. See also Pfeiffer (1968), pp. 164-65. Roller and Pfeiffer both see Strabo’s use of the term as dependent upon Eratosthenes’, but given the incredibly sketchy evidence of earlier works on geographical subjects, the claim is purely speculation. Moreover, the related “κοσμογραφία” is attested for the title of Democritus’ work on geography, see D.L. 9.46.



of his own time.”<sup>377</sup> The difference seems to be, in light of the specific mention of Alexander, the amount of data available after Alexander’s commissions to scientists during his campaign. It is clear that earlier authors had discussed most of the same topics attested in Eratosthenes’ geographical works.<sup>378</sup> Moreover, included within the chronological framework of this reference is Dicaearchus, a writer whose works are extremely fragmentary, but who also worked on geography. Any radical shift in the discipline after Alexander’s campaign could then just as easily be attributed to him, as to Eratosthenes.

Eratosthenes may have been the earliest writer to call his work *Geographika*, at least. Unfortunately, the extremely spotty record of earlier writers makes this impossible to determine with certainty. Perhaps scholars have leaned on this assumption in their pronouncement of Eratosthenes as the first geographer, because it is extremely difficult to decide what qualifies as geography in works not so explicitly named. The discipline developed among early natural philosophers: Anaximander was thought to have been the first mapmaker, and the atomist Democritus apparently wrote a very important geographical work that does not survive at all.<sup>379</sup> Aristotle’s *Meteorologica*, despite its title, contains a large amount of information about things happening on the earth, including issues pertaining to sedimentation, tides, tectonic movement, and it discusses

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<sup>377</sup> Str.1.3.3; F 15 in Roller (2010): “εἰπὼν δὲ καὶ αὐτὸς ὅποσον προὔβη τὰ τῆς οἰκουμένης εἰς γινῶσιν τοῖς μετ’ Ἀλέξανδρον καὶ κατ’ αὐτὸν ἤδη,” Translation Roller (2010).

<sup>378</sup> For example, measurements of the circumference of the earth (Arist. De Cael.2.14, cf. Roller (2010), pp. 6-7; 12-13) and the existence of ‘Hypernoteans’ (Hdt.4.36, cf. Romm (1992), p. 60; Str. 1.3.22; Roller (2010), pp. 136-37)

<sup>379</sup> The work is attested in D.L. 9.46.

larger issues such as the shape and size of the earth.<sup>380</sup> Mathematical geography, which had a strong connection to astronomy, may have developed in the Academy, where Eudoxus worked on the shape and size of Earth.<sup>381</sup>

Geography also had a strong connection to other prose writing traditions, especially history and ethnography. Scholars have often noted how much geographical information Herodotus' *Histories* offers, especially in his lengthy discussion of the Nile.<sup>382</sup> Both Ephorus and Dicaearchus are known primarily as historians.<sup>383</sup> Polybius, writing in the second century BCE, includes expertise in geography as one of the essential characteristics of a historian, and he also composed a treatise on the subject.<sup>384</sup> Conversely, Strabo also wrote a history; it is only the chance survival of half of their works that has classified these two as an historian and a geographer respectively.<sup>385</sup> Similarly, Eratosthenes worked as much on chronology as geography.

The largest collection of texts that can be considered purely geographical are the periploi and travel accounts of those who went to exotic locations and wrote detailed descriptions of their voyages. The earliest recorded such voyage was by Scylax, on behalf of King Darius, into India.<sup>386</sup> Alexander also had geographers keeping careful notes during his campaigns in the east, and the writings of Nearchus and Megasthenes in

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<sup>380</sup> On Aristotle's geography, see Roller (2010), pp.6-7; Romm (1992), pp. 107-09; Thomson (1948), pp.118-21.

<sup>381</sup> Lasserre (1966), pp.236-269; Gisinger (1967); Heilen (2000), pp. 55-63, on Eudoxus' geography.

<sup>382</sup> Hdt.2.19-26. See Thomson (1948), pp. 49-82.

<sup>383</sup> See Geus (2002), pp. 309-332; Fraser (1971), pp. 26-31.

<sup>384</sup> Polyb.12.25e.1. See Clarke (1999), pp. 77-128 on Polybius as a geographer.

<sup>385</sup> Clarke (1999), p. 2, makes this point.

<sup>386</sup> Hdt.4.44. See Romm (1992), pp. 84-85.

particular fit this genre.<sup>387</sup> A number of other far-flung voyages were recorded in the fourth century: Pytheas apparently sailed from Massilia to England and the North Sea; Hanno the Carthaginian rounded the western coast of Africa; a periplus of the Mediterranean survives from the 4<sup>th</sup> century under Scylax's name.<sup>388</sup> There is also a tradition regarding the supposed voyage of Euhemerus to geographical regions difficult to determine precisely.<sup>389</sup> As this list shows, these texts range from those that are relatively reliable and accepted by almost all as actual voyages (the periplus of Pseudo-Scylax) to the almost certainly fictitious (Euhemerus).<sup>390</sup> Ancient scholars had less faith in the historicity of Pytheas' journey than modern ones do; in fact, Eratosthenes' trust in Pytheas earned him scorn from Strabo and Polybius.<sup>391</sup> Regardless of the trust of later readers or the truth of their accounts, these works are only descriptive, not theoretical. They were therefore source materials for other authors to use in their own works that made larger claims, but description has always been a central component of geography and thus the distinction between works containing only description and those containing description and theory is a very fine one.

In fact, in the Hellenistic Period, there seem to have been many authors writing texts that bear similarities to these travelogues, especially in their organization, and these

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<sup>387</sup> Romm (1992), pp. 96-98, on these Indographers, and the general lack of trust in their sometimes fantastical reports. See also Pearson (1960); Pédech (1984).

<sup>388</sup> On Pytheas, see Roller (2006), pp. 57-91; Heilen (2000), pp. 63-71; Romm (1992), pp. 197-98; Casson (1991), pp. 124-26. On Hanno, Roller (2006), pp. 29-43; Carpenter (1966), pp. 81-103. The periplus attributed to Scylax is not the anonymous handbook known as the *Periplus Maris Erythraei*, which is late Hellenistic, but rather details a journey around the Mediterranean. Casson (1991), p. 114, calls the author Scylax the Younger, but he is more commonly referred to as Pseudo-Scylax, see Thomson (1948), p. 88.

<sup>389</sup> Romm (1992), pp. 197-98.

<sup>390</sup> Romm (1992), pp. 196-98.

<sup>391</sup> Str.2.4.1-2. On the historicity of Pytheas' journey, see Casson (1991), pp. 125-26, who takes it as almost certainly true, as does Romm (1992), pp.197-98. Thomson (1948), p.132, n.2, gives a history of the question in earlier scholarship, where it was much more in doubt.

are often also called periploi, for lack of a better term, by authors such as Agatharchides of Cnidus, Timagetus, and Timosthenes of Rhodes.<sup>392</sup> Like travelogues, most of these works also focus only on a smaller region, such as African coast of the Red Sea, in Agatharchides' text. However, these authors don't necessarily claim autopsy, and they often include within their works some theoretical claims based on the information.<sup>393</sup>

In addition, we might add to this list works about botany and zoology, both of which were entwined with geography, and even medical texts. *Airs, Waters, Places* and *On Regimen* both stress the importance of geography and climate for health and medical diagnosis, and the somewhat mysterious *Περὶ ἐβδομάδων* used topographical features as analogies for parts of the body.<sup>394</sup> As this brief overview shows, geography *qua* geography is a difficult thing to 'geographize,' to use Strabo's term. Meyer summarizes the problem thus:

Dies [i.e. the diversity of traditions of geographical writing] liegt einerseits an dem für die Griechen charakteristischen Zugriff auf den Gegenstand 'Erdoberfläche' selbst: Die daraus entstandene Literatur der Antike umfaßt ihrerseits schon ein breites Spektrum zwischen kosmologischer und physikalischer Naturphilosophie auf der einen, kulturhistorischer Ethnographie auf der anderen Seite. Antike Geographen, die in ihrer Wissenschaft in erster Linie ein Bildungsgut sahen, haben wie in augusteischer Zeit Strabon versucht, die verschiedenen Richtungen in einer universalistischen Philosophie oder in der Homeregeese zusammenzuführen.<sup>395</sup>

For this reason, many scholars have sought to find some way of excluding works from the discipline and defining geographical writing more narrowly. Fraser, for example,

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<sup>392</sup> Meyer (1998); Fraser (1972), pp.520-35 on Timosthenes, pp. 539-53, on Agatharchides. Timagetus is almost only known from scholia to Apollonius' *Argonautica*, see Gärtner (2006).

<sup>393</sup> See Meyer (1998), esp. pp. 210-213.

<sup>394</sup> Jouanna (1999), pp. 146-48.

<sup>395</sup> Meyer (1998), p. 198.

makes a strong distinction between geographers and the paradoxographers, such as Callimachus, whose work sometimes verged on geographical.<sup>396</sup>

This is not only a problem for modern scholars. If everything is geography, then nothing is geography, and the category is meaningless. I believe that this problem was already an issue in antiquity, and we can see struggles to define the discipline in the surviving texts. In the opening preface to his *Geography*, in the 2<sup>nd</sup> century CE, Ptolemy still needed to define and limit his field of inquiry, opening his work by drawing a distinction between geography and chorography, the latter of which describes the study of individual places, not the entire earth.<sup>397</sup> In the Hellenistic Period, many geographical writers attempted to define and consequently limit what their field entailed.

Strabo begins his work with the claim that geography is “τῆς τοῦ φιλοσόφου πραγματείας,” and the first two volumes of the work are devoted to proving this point.<sup>398</sup> For example, he uses one of the most important fragments of Eratosthenes’ work, on the question of the relationship between poetry and geography, to make a subtle point about the definition of the latter. The passage, though lengthy, merits quotation (almost) in full:

[Eratosthenes] says that every poets aims to delight the soul, not to teach (στοχάζεσθαι ψυχαγωγίας, οὐ διδασκαλίας). On the contrary, the ancients say that poetry is foremost a pursuit of knowledge, introduced into our life from youth, that teaches us about character, emotion, and actions (ἦθη καὶ πάθη καὶ πράξεις) through pleasure. And today we say that only the poet is a sage. This is why

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<sup>396</sup> Fraser (1972), pp. 454-55, see also Meyer (1998), pp. 197-99. Fraser has immense respect for Eratosthenes, however, and, among other Hellenistic writers, Agatharchides of Cnidus. He makes a distinction between these works, as serious attempts at physical geography, and other writers, such as Philostephanus and Mnaseas, whose work is more fantastical. See also Fraser (1972), pp. 523-25; 539. He also makes a distinction between ‘Geographical writing,’ which he includes under the sub-heading of “Alexandrian Literature” and the physical sciences, which have their own chapter.

<sup>397</sup> Ptol. *Geo.* Praef. 1. It is evident from Strabo’s use of the term that this distinction was not made in the Hellenistic period.

<sup>398</sup> Str. 1.1.1.

Greek cities first educate their youth through poetry, presumably not for the sake of delighting the soul but to teach morality...Aside from these points, Eratosthenes contradicts himself. Shortly before he said this, at the beginning of his geographical treatise, he says that from the earliest times all of them [the poets] have eagerly placed themselves in the middle of the investigation of such matters. Indeed, [Eratosthenes says that] whatever Homer learned about the Ethiopians he recorded in his poem, as well as about the Egyptians and Libyans...Does someone who does this resemble an entertainer or a teacher? By Zeus, the latter, you say, but that which is beyond perception (τὰ δ' ἔξω τῆς αἰσθήσεως) he [Homer] and others have filled with legendary marvels. He [Eratosthenes] ought to have said that every poet creates only to delight the soul *and* to teach, but he said, 'only to delight the soul, not to teach.' He meddles still further when he asks how it contributes to the virtue of the poet to gain experience in places, or military command, or farming, or rhetoric, or whatever else others might wish him to know about. The desire for him to acquire everything would be going beyond the proper limit in ambition, just as if someone, as Hipparchus says, were to hang apples and pears on Attic wreaths, which cannot hold them, burdening him with all knowledge and every skill. You may be right, Eratosthenes, about that, but you are not right when you take away from him [Homer] his great learning, and represent his poetry as the mythology of an old woman, who has been allowed to fabricate, he says, whatever seems fitting for her entertainment (ψυχαγωγίας).<sup>399</sup>

ποιητὴν γὰρ ἔφη πάντα στοχάζεσθαι ψυχαγωγίας, οὐ διδασκαλίας. τοῦναντίον δ' οἱ παλαιοὶ φιλοσοφίαν τινὰ λέγουσι πρώτην τὴν ποιητικὴν, εἰσάγουσαν εἰς τὸν βίον ἡμᾶς ἐκ νέων καὶ διδάσκουσαν ἤθη καὶ πάθη καὶ πράξεις μεθ' ἡδονῆς: οἱ δ' ἡμέτεροι καὶ μόνον ποιητὴν ἔφασαν εἶναι τὸν σοφόν. διὰ τοῦτο καὶ τοὺς παῖδας αἱ τῶν Ἑλλήνων πόλεις πρώτιστα διὰ τῆς ποιητικῆς παιδεύουσιν, οὐ ψυχαγωγίας χάριν δῆπουθεν ψιλῆς, ἀλλὰ σωφρονισμοῦ... χωρὶς δὲ τούτων ὁ Ἐρατοσθένης ἑαυτῷ μάχεται: μικρὸν γὰρ πρὸ τῆς λεχθείσης ἀποφάσεως ἐναρχόμενος τοῦ περὶ τῆς γεωγραφίας λόγου φησὶν ἅπαντας κατ' ἀρχὰς φιλοτίμως ἔχειν εἰς τὸ μέσον φέρειν τὴν ὑπὲρ τῶν τοιούτων ἱστορίαν. Ὅμηρον γοῦν ὑπὲρ τε τῶν Αἰθιοπίων ὅσα ἐπύθετο καταχωρίσαι εἰς τὴν ποιήσιν καὶ περὶ τῶν κατ' Αἴγυπτον καὶ Λιβύην... πότερον οὖν ὁ ποιῶν ταῦτα ψυχαγωγοῦντι ἔοικεν ἢ διδάσκοντι; νῆ Δία, ἀλλὰ ταῦτα μὲν οὕτως εἶρηκε, τὰ δ' ἔξω τῆς αἰσθήσεως καὶ οὗτος καὶ ἄλλοι τερατολογίας μυθικῆς πεπληρώκασιν. οὐκοῦν ἐχρῆν οὕτως εἰπεῖν, ὅτι ποιητὴς πᾶς τὰ μὲν ψυχαγωγίας χάριν μόνον ἐκφέρει τὰ δὲ διδασκαλίας: ὁ δ' ἐπήνεγκεν ὅτι ψυχαγωγίας μόνον, διδασκαλίας δ' οὐ. καὶ προσεξεργάζεται γε, πυνθανόμενος τί συμβάλλεται πρὸς ἀρετὴν ποιητοῦ πολλῶν ὑπάρξαι τόπων ἔμπειρον ἢ στρατηγίας ἢ γεωργίας ἢ ῥητορικῆς ἢ οἷα δὴ περιποιεῖν αὐτῷ τινες ἐβουλήθησαν; τὸ μὲν οὖν ἅπαντα ζητεῖν περιποιεῖν αὐτῷ προεκπίπτοντος ἂν τις θεῖη τῇ φιλοτιμίᾳ, ὡς ἂν εἴ τις, φησὶν ὁ Ἴππαρχος, Ἀττικῆς εἰρεσιώνης κατηγοροίη καὶ ἂ μὴ δύναται φέρειν μῆλα καὶ ὄγχνας, οὕτως ἐκείνου πᾶν μάθημα καὶ πᾶσαν τέχνην. τοῦτο μὲν δὴ ὀρθῶς ἂν λέγοις, ὃ Ἐρατόσθενης: ἐκεῖνα δ' οὐκ ὀρθῶς, ἀφαιρούμενος αὐτὸν τὴν

<sup>399</sup> Str.1.2.3. Translation adapted from Roller (2010).

τοσαύτην πολυμάθειαν καὶ τὴν ποιητικὴν γραῶδη μυθολογίαν ἀποφαίνων, ἣ δέδοται πλάττειν, φησὶν, ὃ ἂν αὐτῇ φαίνεται ψυχαγωγίας οἰκεῖον.

To Strabo, the devoted Stoic, the idea of poetry lacking practical value was anathema, and the intensity of his rebuttal here, as well as the interjected quotation of Hipparchus, make it difficult to parse Eratosthenes' argument precisely.<sup>400</sup> Strabo in fact conflates two separate issues: the role of poetry in society and the value of Homer as a geographical source.<sup>401</sup> They are obviously related, but Strabo has his own motivations for combining them. The issue of Homer's position as a geographer is more relevant for Strabo's work, but that is, essentially, a scholarly question. The larger question of the function of poetry is one with a storied background in philosophical writing, and this is evident throughout Strabo's discussion. The word Eratosthenes uses, "ψυχαγωγία," has strong connections to Platonic ideas about poetry, suggesting that his ideas were influenced by the Platonism evident in other works of his.<sup>402</sup> His skepticism over whether "it contributes to the virtue of the poet to gain experience in places or military command or farming or rhetoric or whatever else others might wish him to have acquired," also seems influenced by the *Ion*.<sup>403</sup> Strabo rebuts these ideas with an un-cited quotation from Aristotle's *Poetics*, citing poetry's portrayal of "character, emotion, and actions."<sup>404</sup> A well-informed ancient reader would surely recognize the philosophical heritage of this argument, which runs from Plato through Aristotle to the Stoa.

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<sup>400</sup> On this passage, see Trachsel (2008); Cusset (2008); Geus (2002), pp. 265-67.

<sup>401</sup> Trachsel (2008), p. 107

<sup>402</sup> Cusset (2008), 124-28. On psychagogia in poetry, Pl.*Phaed.*261a-c; 271c-272b

<sup>403</sup> Pl.*Ion.*536d-541c, especially 541a-c, on how the best rhapsode should be the best general.

<sup>404</sup> Arist.*Poet.*1447a28.

The philosophical tenor of the argument seems to come primarily from Strabo rather than Eratosthenes. A tradition records that Eratosthenes refused to refer to himself as a philosopher, preferring the appellation philologist.<sup>405</sup> The *Geographika* was most likely written late in his career, in Alexandria, when his philosophical interests, evident in the early treatise *Platonicus*, had dissipated.<sup>406</sup> We should therefore be careful about ascribing too much of the philosophical element in this passage to him. Strabo, on the other hand, actively sought to justify geography as a discipline within philosophy, as seen in the opening line of his work. By making the issue of Homer's evidence part of a well-established philosophical discussion, Strabo helps substantiate his claim that his discipline deserves to be considered a part of such discourse, rather than relegating the question of Homer's importance to philological scholars. It is even possible that Eratosthenes did not make the claim about poetry in the context of discussing Homer at all. This obscures our ability to understand exactly how Eratosthenes really felt about Homer, but it does help us understand Strabo.

Scholars have wondered why Strabo did not use Eratosthenes' poetry as evidence in his argument against the earlier geographer, as it seems to confirm his belief that poetry is fundamentally didactic.<sup>407</sup> This would, however, defeat the purpose of this entire passage. Strabo chooses to refute Eratosthenes' arguments not with his poetry, but instead with a philosophical argument. The passage is presented not to quarrel with

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<sup>405</sup> Sueton.gramm.10.

<sup>406</sup> Roller (2010), pp.12-13; Geus (2002), pp.56-57.

<sup>407</sup> Trachsel (2008), pp. 109-110, suggests this. Cusset (2008), pp.128-35, attempts to argue that the poems support Eratosthenes' separation between poetry and education.



Eratosthenes' claim about poetry, which Strabo thinks is obviously untrue, but to prove that the question of Homer's geography is important for philosophical discourse.

The fragments of Hipparchus' geographical work suggest an attempt to pull the discipline closer to mathematical astronomy and geometry, and away from descriptions culled from travel reports. He wrote a work that Strabo calls "Against the *Geography* of Eratosthenes," and the arguments that survive seem to be based primarily on inconsistencies between the records Eratosthenes uses and Hipparchus' own geometrical measurements.<sup>408</sup> Moreover, Strabo writes, "Hipparchus rightly points out in his treatise against Eratosthenes that, while geographical knowledge is the concern of everyone whether layman (ιδιώτη) or scholar (φιλομαθοῦντι), it is impossible to attain it without consideration of the heavens and of the observations of eclipses."<sup>409</sup> It seems that Hipparchus' work, relying mainly on astronomical and geometrical methods of determining the relative positions of places, as opposed to the travelers' accounts of distances on which Eratosthenes relied extensively, was attempting to move the field closer to the mathematical sciences and away from the travelogues that often included a great deal of paradoxographical material.<sup>410</sup>

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<sup>408</sup> Dicks (1960), pp. 31-35.

<sup>409</sup> Hipparch. fr.11 Dicks: "εὖ δὲ καὶ Ἰππάρχος ἐν τοῖς πρὸς Ἐρατοσθένη διδάσκει, ὅτι παντί, καὶ ιδιώτη καὶ τῷ φιλομαθοῦντι, τῆς γεωγραφικῆς ἱστορίας προσηκούσης ἀδύνατον μεταλαβεῖν ἄνευ τῆς τῶν οὐρανίων τῆς τῶν ἐκλειπτικῶν τηρήσεων ἐπικρίσεως." Translation from Dicks (1960), p. 65.

<sup>410</sup> Ironically, Eratosthenes is most famous for his measurement of the circumference of the Earth, a calculation that he used very few distances for, and instead used primarily geometry. See Thomson (1948), pp. 159-62, for a lengthy description of the calculation. Hipparchus' criticisms are leveled more at Eratosthenes' work in the *Geographika*, where he relied heavily on travelers' accounts and usually trusted their measurements of distance. See Roller (2010), p. 20.

And yet, Hipparchus makes some distinction between mathematics and geography. Despite Eratosthenes' modern reputation for great mathematical ability, Hipparchus seems somewhat disdainful of him in that regard. Strabo writes that:

Therefore, at the end of the second book of his work *Against the "Geography" of Eratosthenes*, he censures certain remarks made about the Ethiopians, and says that in his third book his viewpoint will be more mathematical, but still to some extent geographical... In a way Eratosthenes ranks as a mathematician (μαθηματικός) among the geographers, but as a geographer (γεωγραφικός) among the mathematicians, so that on both accounts he affords opportunities for the criticism of those who disagree with him.<sup>411</sup>

αἰτιασάμενος δ' οὖν τινα τῶν Αἰθιοπικῶν ἐπὶ τέλει τοῦ δευτέρου ὑπομνήματος τῶν πρὸς τὴν Ἐρατοσθένους γεωγραφίαν πεποιημένων, ἐν τῷ τρίτῳ φησὶ τὴν μὲν πλείω θεωρίαν ἔσεσθαι μαθηματικὴν, ἐπὶ ποσὸν δὲ καὶ γεωγραφικὴν... τρόπον τινὰ ἐν μὲν τοῖς γεωγραφικοῖς μαθηματικός, ἐν δὲ τοῖς μαθηματικοῖς γεωγραφικός ὢν [sc. Eratosthenes], ὥστε πρὸς ἄμφω δίδωσιν ἀφορμὰς τοῖς ἀντιλέγουσιν.

Hipparchus seems to be making a distinction between the two, and surely would describe himself as a mathematician. The fragments are too lacunose to be certain, but they suggest an attempt to bring geography into greater alignment with astronomy, with a focus on mathematical calculation, rather than topographical and ethnographic description.

One possible argument against this would be Hipparchus' faith in Homer as a geographer, which appears to be stronger than Eratosthenes'.<sup>412</sup> Hipparchus' position on Homeric geography is difficult to determine precisely, however. Strabo claims him as an ally for the declaration that Homer was the first geographer, and he is also cited on other

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<sup>411</sup> Translation from Dicks (1960), fr. 34. The ellipse is to indicate that the passage in Strabo is not continuous, but Dicks believes it comes from a single passage of Hipparchus.

<sup>412</sup> Neumann (1886) attempts to explain why Hipparchus considered Homer a geographer. See also Dicks (1960), p. 113.

matters of Homeric geography, but the evidence suggests he was not as fully committed to defending the poet as Strabo:

The desire for him to acquire everything would be going beyond the proper limit in ambition, just as if someone, as Hipparchus says, were to hang apples and pears on Attic wreaths, which cannot hold them, burdening him with all knowledge and every skill.<sup>413</sup>

τὸ μὲν οὖν ἅπαντα ζητεῖν περιποιεῖν αὐτῷ προεκπίπτοντος ἂν τις θεῖη τῇ φιλοτιμίᾳ, ὡς ἂν εἴ τις, φησὶν ὁ Ἱππαρχος, Ἀττικῆς εἰρεσιώνης κατηγοροῖη καὶ ἂ μὴ δύναται φέρειν μῆλα καὶ ὄγχνας, οὕτως ἐκείνου πᾶν μάθημα καὶ πᾶσαν τέχνην. (Str.1.1.2)

Hipparchus' criticism does not appear to address the role of poetry in society, or even Homer's geographical knowledge, but rather the impossibility of one person being good at as many things as are attributed to the poet. It seems unlikely that Hipparchus felt Homer's geographical value was equal to his own. Hipparchus may have had more respect for the tradition of claiming Homer as a geographer than Eratosthenes, but he defines his own work against Eratosthenes' more than against the poet's.

Hipparchus' interest lies in making astronomical observation a larger part of geography, and Strabo wants to incorporate the discipline into philosophical discussions. They both support using Homer as a source, but their discussion of this question comes in the course of their own attempts to define the discipline more sharply, and it is therefore likely that Eratosthenes' discussion of Homer's role in the history of geography came from a similar project. For Eratosthenes, the refutation of Homer appears to have a particularly pressing issue, and this may be because Homer's geography was also an important subject for the other scholars at the Mousaion who worked on the text of

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<sup>413</sup> Dicks (1960), fr. 2, from Strab.1.2.3. quoted above.

Homer. In the remainder of this section, I will consider how Eratosthenes' biography can better help us understand his position on the issue.

Eratosthenes' life before his appointment to the Library in Alexandria is plentifully attested in later works, but there are many chronological inconsistencies that make it difficult to assess the trustworthiness of any of them. He is supposed to have studied with Callimachus while in Cyrene and Zeno in Athens, but the generally accepted dates for his life (276-196 BCE) make both of these suppositions impossible.<sup>414</sup> He almost certainly spent some amount of time in Athens before becoming Librarian at Alexandria later in his life.<sup>415</sup> As was quite common in the 3<sup>rd</sup> century, he studied with an eclectic group of scholars, but he may have had a special affiliation with the Academy because of his expertise and interest in mathematics.<sup>416</sup> In antiquity, he was known for his wide-ranging interests, and later sources claim he was called "Pentathlos," because he worked not in just one discipline but in many, and "Beta," because he was the second-best at everything; the latter nickname in particular suggests that he was not especially popular among his contemporaries.<sup>417</sup> His attested works demonstrate his polymathic interests: they include philological works on comedy, a presumably philosophical work of unknown genre called the *Platonicus*, several works of poetry (including a poem about Hermes, an epigram boasting of his success in doubling a cube, and an epyllion about Ikarios), several works on astronomy and catasterism, a universal chronography, and, of

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<sup>414</sup> Roller (2010), pp. 8-9; Pfeiffer (1968), p. 153; Geus (2002), pp. 18-26, gives a more thorough account of the different attested teachers of Eratosthenes.

<sup>415</sup> Geus (2002), pp. 26-30.

<sup>416</sup> Geus (2002), pp. 140-205; Wolfer (1954); Solmsen (1942) on Eratosthenes' mathematical works and his connection to the Academy.

<sup>417</sup> Roller (2010), p. 9. Geus (2002), p. 39, suggests that in fact the nickname 'Beta' may have originally meant that he was a second Plato, but that this explanation was lost over time.

course, his geographical works.<sup>418</sup> In modern scholarship, he is best known for these geographical treatises, but this does not seem to have been the case in antiquity. Strabo shows that these geographical works were read extensively in the Hellenistic period, especially by Hipparchus and Polybius, but were not favorably received.<sup>419</sup> Moreover, neither Strabo's nor Eratosthenes' geographical works seem to have been read much after the second century CE; thus, although Pliny cites Eratosthenes frequently, Athenaeus knows him primarily as a poet.<sup>420</sup>

Eratosthenes is particularly famous for his rejection of attempts to locate the wanderings of Odysseus and other mythological figures within the *oikoumene*. He famously claimed that, “you might discover where Odysseus wandered whenever you find the cobbler who sewed up the bag of winds.”<sup>421</sup> This quip and his statement in the above-quoted Strabo passage that poets “aims to delight the soul, not to teach,” provide our best evidence for his views on the subject. Roller thinks this claim is directed more at contemporary poets, such as Aratus and especially Apollonius, than at Homer himself.<sup>422</sup> But if that is the case, it is difficult to know what to do with Eratosthenes' own poetry. The most substantial fragment of the *Hermes* evidently recounts the god travelling up to the heavens and looking down on the earth:

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<sup>418</sup> On terrible state of Eratosthenes' fragments, Möller (2003). Pfeiffer (1968), p. 153, already attests to this, but it is still a major problem that no complete edition of the fragments of his works has been attempted since Berhardy (1822).

<sup>419</sup> Aujac (2001), pp. 87-105; Dicks (1960), pp. 31-35.

<sup>420</sup> Roller (2010), p. 15; Aujac (2001), pp.105-22. However scarcely he was read, Dionysius Perigetes had a copy at least, see Roller (2010), p.33; Hunter (2003).

<sup>421</sup> Str. 1.2.15. “φησὶ τότε ἄν εὐρεῖν τινα ποῦ Ὀδυσσεὺς πεπλάνηται, ὅταν εὕρη τὸν σκυτέα τὸν συρράψαντα τὸν τῶν ἀνέμων ἄσκόν.”

<sup>422</sup> Roller (2010), pp. 113-114.

He cut the middle of the whole cosmos from the center sphere, and he fastened it through the celestial axis. And five encircling belts were coiled around it, two darker than gray-blue, one sandy and red as if from fire. This one was in the middle, and all of it had burned, struck by flames, when the summer rays set it afire as it leaned towards Maira herself. And two stretch to the poles on either side, always icy, always dripping with water. Not water, but rather, ice from the sky lies there, and it covers the earth and creates frost. These lands are inaccessible to people, but there are two others, opposite each other, midway between summer and ice-rain, both temperate and growing corn, the fruit of Eleusinian Demeter; and in them live men opposite each other. (Powell fr. 16)

Αὐτὴν μὲν μιν ἔτετμε μεσήρεα παντὸς Ὀλύμπου  
 κέντρον ἄπο σφαιρῆς, διὰ δ' ἄξονος ἠρήρειστο.  
 Πέντε δὲ οἱ ζῶναι περιειλάδες ἐσπείρηντο·  
 αἱ δύο μὲν γλαυκοῖο κελαινότεραι κυάνοιο,  
 ἡ δὲ μία ψαφαρὴ τε καὶ ἐκ πυρὸς οἶον ἐρυθρή.  
 Ἡ μὲν ἔην μεσάτη, ἐκέκαυτο δὲ πᾶσα περι<πρὸ>  
 τυπτομένη φλογμοῖσιν, ἐπεὶ ῥά ἐ Μαΐραν ὑπ' αὐτὴν  
 κεκλιμένην ἀκτῖνες ἀειθερές πυρόωσιν·  
 αἱ δὲ δύο ἐκάτερθε πόλοις περιπεπτηυῖαι,  
 αἰεὶ κρυμαλέαι, αἰεὶ δ' ὕδατι νοτέουσαι·  
 οὐ μὲν ὕδωρ, ἀλλ' αὐτὸς ἀπ' οὐρανόθεν κρύσταλλος  
 κεῖτ', αἰῶν τ' ἀμπίσχε, περὶ ψυχὸς δ' ἐτέτυκτο.  
 Ἀλλὰ τὰ μὲν χερσαῖα ἀνέμβατά ἀνθρώποισι·  
 δοιαὶ δ' ἄλλαι ἔασιν ἐναντία ἀλλήλησι  
 μεσσηγὺς θέρεός τε καὶ ὑετίου κρυστάλλου,  
 ἄμφω εὐκρητοὶ τε καὶ ὄμπνιον ἀλδήσκουσαι  
 καρπὸν Ἐλευσίνης Δημήτερος· ἐν δὲ μιν ἄνδρες  
 ἀντίποδες ναίουσι.<sup>423</sup>

Eratosthenes describes in this poem both the 5-zone model of the planet and the existence of people living in the Antipodes, both of which he abandons in the *Geographika*.<sup>424</sup> It is unclear, however, whether we should think of this poem as another element of Eratosthenes' earlier work that he later rejects, or as a demonstration of non-didactic

<sup>423</sup> Text is from Cusset (2008), who follows Hiller (1872) in eliminating the lacuna Powell (1925) inserted between *χερσαῖα* and *ἀνέμβατοι* (13).

<sup>424</sup> The question of the Antipodeans is addressed more directly, see Str. 1.3.22, Roller (2010), pp. 136-37. Although he never explicitly rejects the traditional 5-band organization of the world, it does not seem to have been a major factor in his more complicated spheroidal system (see Roller (2010), pp. 26-27). See also Thomson (1948), pp. 162-63.

geographical poetry. With its detailed and precise description of the overall structure of the Earth, this passage seems equally well suited to “διδασκαλία” and “ψυχαγωγία,” but without an explicit claim of didactic intent, that may only be incidental.

Cusset offers a close reading of this passage that highlights the very high level of poetic skill within it.<sup>425</sup> The chiasmic description of the extreme cold and hot zones (cold-hot, lines 4-5, hot-cold, lines 6-12) replicates the structure of the planet within the poem. The entire passage is unified by echoes throughout, most noticeably in the repetition of κρύσταλλος, and the echo of κρυ- in κρυμαλέαι and (in reverse) ἐύκρητοί, both in the same metrical position, in the lines immediately preceding and following the respective instances of κρύσταλλος. This mirroring is also evident in the prominent position of the term ἀντίποδες, perhaps itself a bit of wordplay. On the other hand, Cusset claims that the only scientific aspect of this passage is the careful repetition of numbers (Πέντε... δύο... μία... δύο... δοιαί... ἄμφω), which prevents the reader from getting confused.<sup>426</sup> He ignores the other ways in which the science and poetry interact, probably because of his opinion on the relationship between the two, which emerges in his discussion of Strabo’s quotation:

Et si Eratosthène refuse à la poésie d’être didactique, d’être faite pour transmettre un enseignement, c’est parce que le discours poétique n’est jamais direct, dogmatique, autoritaire ou magistral, mais recourt à toutes sortes de détours stylistiques qui peuvent conduire l’âme, mais non diriger la raison.<sup>427</sup>

Cusset seems to be channeling Plato, whose Socrates in the *Theaetetus* lauds modern teachers who speak “in order that even cobblers might hear their wisdom and learn,”

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<sup>425</sup> Cusset (2008), pp. 129-35, from which the rest of the paragraph is summarized.

<sup>426</sup> Cusset (2008), p.131.

<sup>427</sup> Cusset (2008), p.127.

contrasting them with the ancient poets who hid their meanings in allegorical representations of mythical figures.<sup>428</sup> But surely, didactic literature does not need to be direct, dogmatic, or overbearing to be educational. The patterns in Eratosthenes' poetic descriptions underscore the importance of the pattern and structure in the layout of the earth. The fact that this does so in an indirect and subtle way perhaps even strengthens the effect. Even if he did not intend to be one, Eratosthenes is himself a didactic poet.

This fragment contains inconsistencies with at least two positions Eratosthenes holds in the *Geographika*. In his later career, it seems that he had reversed his opinion on the existence of Antipodeans and the latitudinal belt system of the Earth, and he may have developed a more hard-line stance about the relationship between geography and poetry. Klaus Geus has proposed that that Eratosthenes wrote the poem while he was a student in Athens, still heavily interested in Platonism.<sup>429</sup> The *Hermes* fragment does show to a great extent the influence of the *Timaeus*.<sup>430</sup> Geus argues that he wrote the *Geographika* later, after he had moved to Alexandria, and was less influenced by Platonism in his work.<sup>431</sup> If the *Hermes* represents a younger Eratosthenes, experimenting with writing about geography in verse, then perhaps his later vociferous rejection of it reflects the zeal of the convert. If, after moving to Alexandria Eratosthenes rethought his opinion on the subject of poetry and Homer, it was likely at least in part because of friction with scholars working directly on the Homeric texts, including Apollonius. What emerges from the remnants of this discussion from Eratosthenes, to

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<sup>428</sup> Pl. *Thi.* 180d: “ἵνα καὶ οἱ σκοτοτόμοι αὐτῶν τὴν σοφίαν μάθωσιν ἀκούσαντες”

<sup>429</sup> Geus (2002), p. 54.

<sup>430</sup> Solmsen (1942).

<sup>431</sup> See Geus (2002), p. 57.



Hipparchus, extant in Strabo, is that Eratosthenes' discussion of Homeric geography probably related to his own attempts to define the discipline. In the following section, I will consider Apollonius' attempt to define the subject, and the fact that, counter to Eratosthenes, he affords a central place to epic poetry.

### III. Narrative Geography in the *Argonautica*

Geography is pervasive in the *Argonautica*. Scholars have acknowledged and discussed this since Émile Delage claimed that:

L'épopée d'Apollonios est surtout géographique. Sans doute, dans cette oeuvre toffue et erudite, l'astronomie, la magie, l'art nautique, la médecine, la peinture de l'amour et la mythologie intéressent aussi le lecteur. Mais aucun de ces éléments n'occupe une place aussi grande que la géographie.<sup>432</sup>

Some scholars may object to the subsidiary place Delage gives to these other elements of the poem, and many of them, especially navigation, are very difficult to consider separately from geography, but his main claim is still uncontroversial. Only the third book, which is recognized as being somewhat distinct from the other three, departs from the geographical focus and takes place entirely in one place, Colchis.<sup>433</sup> In the remainder of the poem, the so-called "voyaging" books, it is very difficult to find a passage that does not offer some geographical information. Moreover, this information is typically very specific, giving precise details of exactly where the Argonauts experienced each adventure (and where other characters travelled, in digressions from the main narrative).

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<sup>432</sup> Delage (1930), p. 9. Delage (1930) is still the seminal work, but a lot of recent work has been done. See especially Thalmann (2011), West (2003), Nishimura-Jensen (2000), Clauss (2000), Hurst (1998), Rubio-Fernaz (1992), Clare (1993), Beye (1982), pp. 100-119; Pearson (1938).

<sup>433</sup> See Hutchinson (1988), pp. 94-97, and especially Nyberg (1992) on the criticisms of disunity that have been leveled at the poem. Nyberg argues that the poem's thematic unity cancels out any lack of Aristotelian coherence. Hutchinson questions whether such criteria are even necessary.

The specificity of Apollonius' geographical references are a major part of Zanker's argument about the use of this information to enhance the realism of the work.<sup>434</sup> The Argonauts do not travel to mythological and fantastical places, but to well-known locations within the *oikoumene*. The reader, should she desire, can travel to each of these places for herself.<sup>435</sup>

Ideas about the meaning of this omnipresent geographical detail has not reached the same level of consensus. Many scholars have regarded the geography as being connected to the *Argonautica*'s relationship with time as well as space. In such readings, Apollonius uses aitia to show the connection between this mythological, heroic past and the modern day, when, as the poet repeatedly claims, late-born humans can still see the traces of their voyage.<sup>436</sup>

Other critics have identified a political meaning in Apollonius' geography.<sup>437</sup> More than most scientific disciplines, geography is directly connected to the political reality of the people who study it. Geography always had a political dimension, and this was especially true in the Hellenistic period. The impact of Alexander's campaigns on the body of knowledge available, the competing territorial claims of the successor kings, and the question of Greek identity for those living in beyond the mainland played an

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<sup>434</sup> Zanker (1987), pp. 122-23.

<sup>435</sup> In fact, many have attempted to make the voyage and used this to assess the level of accuracy in Apollonius' knowledge of navigation, such as Severin (1985). See also Rostropowicz (1990).

<sup>436</sup> On the issue of time in the *Argonautica* and distinction between the heroic age and Apollonius' time, see Barnes (2003); Fantuzzi and Hunter (2004), pp. 91-92; Dickie (1990); Zanker (1987), pp. 120-21, argues that this interest in aitiology offered "a much needed sense of cultural continuity for the Greek intelligentsia resident in the newly founded city of Alexandria." Zanker even intriguingly suggests, pp. 16-17, that interest in aitia was so high at this time that even including them was a nod to the present.

<sup>437</sup> On the political aspects of Apollonius' geography, see Thalmann (2011); Schrijvers (2009); Stephens (2011); Cusset (2004). Mori (2008) discusses Apollonius' politics more broadly, but does not engage with the geographical manifestations of it.

important role not only in what was studied but also in what conclusions were drawn.<sup>438</sup>

This is clearly an influential factor in Apollonius' use of geography as well. Moreover, all of the work done at the Library and the Museum, scientific, philological, or literary, was undertaken and completed in service to the Ptolemies, and geographical study was no different.

Apollonius uses the route of the Argo to define the borders of the *oikoumene*, and his relationship with Ptolemy II makes this a politically fraught project. Furthermore, the Herodotean association of the Colchians with the Egyptians casts an interesting light on the Argonauts' journey.<sup>439</sup> For example, Apollonius depicts Libya as a vast desert, completely uninhabited: "air and swaths of vast land equal to the air stretched out far and unchanging; they saw no watering hole, no path, no stable for herdsman in the distance, but everything was covered in a silent calm."<sup>440</sup> Information about Libya was not particularly detailed at this time, but there was one source, written by an Ophellas, possibly in the service of Alexander, that recorded a large number of Phoenician settlements in the area.<sup>441</sup> Apollonius' deserted Libya, without Carthaginian settlements already in place, looks far more available for Ptolemaic expansion. This suggests that we cannot divorce the political realities from the scholarly decisions the poet makes.

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<sup>438</sup> See Stephens (2003). It is interesting that Apollonius ignores India and regions of the Near East that were known mainly through campaign reports from Alexander's journeys. This may be because he is focusing on Homeric geography, as will be discussed in this section, and those places do not figure in the archaic epics.

<sup>439</sup> Stephens (2011), pp. 198-99, makes this connection, arguing that Apollonius is deliberately pulling Alexandria into the Greek world, both geographically and literarily. It would be interesting to bring this argument into conversation with questions of how much we are meant to sympathize with Jason and the Argonauts and endorse their behavior.

<sup>440</sup> A.R.4.1246-49: "ἡέρα καὶ μεγάλης νῶτα χθονὸς ἠέρι ἴσα./ τηλοῦ ὑπερτείνοντα διηνεκές: οὐδέ τιν' ἀρδμόν./ οὐ πάτον, οὐκ ἀπάνευθε κατηγύασσαντο βοτήρων/ αὐλιον, εὐκλήω δὲ κατείχετο πάντα γαλήνη."

<sup>441</sup> See Ameling (2006).

Considerable work has also been done on the construction of space and place within the poem. Santiago Rubio-Fernaz has argued that Apollonius uses geographical space as the framework around which to build his narrative, and William Thalmann, in turn, has shown how that process in fact creates space (or more properly, place), by using it.<sup>442</sup> That is, the experience of each of these places defines it as much as the places themselves drive the narrative of those experiences. Thalmann has shown that Apollonius' understanding of space is far from simple. The poet uses multiple different approaches in the poem to great effect, such as the disjunction between the panoptic view Jason takes on Mt. Dindymon of the surrounding area and the linear journey that occupies most of the rest of Book 2.<sup>443</sup>

My focus in what follows will be on the position of Apollonius within the scholarly discussion about geography as discipline, as outlined in the previous section, and on his position on Homer as a geographer. The *Argonautica* incorporates two different types of geographical writing. The first two books resemble a periplus, and the geography within them is closely tied to technical literature. Apollonius leans heavily on the use of signs to prove the authenticity of his geography, which could be characterized as "Aratean." The final book, however, departs from the earlier emphasis on signs and instead offers a polemical stance on the contentious debate about the location of wanderings of Odysseus. I will first give an account of the entire journey of the Argo as Apollonius presents it to show that there is a coherent route that can be mapped. I will

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<sup>442</sup> The distinction between 'space' and 'place' used here is dependent upon the definitions in Tuan (1977). Both Thalmann (2011) and Rubio-Fernaz (1992) use Tuan's theory of space extensively.

<sup>443</sup> Thalmann (2011), pp. 4-8.

then consider how Apollonius uses allusions to Aratus and signs in the landscape to discuss the relationship between poetry and geography and to prove his veracity. The authority constructed in these books, I will then show, allows Apollonius to offer, in the return journey, an essay on Homeric geography.

The first half of the Argo's voyage, the route to Colchis, is fairly straightforward.<sup>444</sup> The Argonauts sail from Iolcus through the northern Aegean, staying relatively close to the eastern coast of Greece and stopping at several places both on the mainland (e.g. Magnesia) and on the islands (e.g. Lemnos). Then they sail through the Hellespont, into the Sea of Marmara, where they travel along the southern coast and have the majority of their most famous adventures (the fight with Cyzicus, the propitiation of Rhea on Mt. Dindymon, the rape of Hylus, and the boxing match of Amycus and Polydeukes), and then cross to the northern coast (narrowly avoiding the Bosphorus), where they visit Phineus in Thrace. After this, they go through the Clashing Rocks at the Bosphorus and enter the Black Sea, and sail along its southern coast, stopping occasionally for less famous episodes (such as the deaths of Idmon and Tiphys, and the Island of Ares) before rounding the southeastern corner of the sea, sailing past the Caucasus Mountains, and entering the mouth of the river Phasis, where Colchis is situated. This comprises the first two books, and Apollonius offers throughout a wealth of place names, often including some mythological or ethnographical detail even for places which the Argonauts merely sail past. Most of the extended adventures (and some of the more brief

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<sup>444</sup> On the route the Argonauts take, see Delage (1930), pp. 74-190.

stops) also end with aitia, where an altar or a grave remains as a marker of the visit of the Argonauts.

Many scholars have commented that the trip to Colchis resembles a versified periplus.<sup>445</sup> After the launching of the Argo, the remainder of the first book and the entire second book is made up of extended passages in which Apollonius demonstrates his skill at naming places and geographical features, interspersed occasionally with episodes from the Argo's landfalls. It is clear that Apollonius had a wealth of stories about visits to specific places to draw upon in drafting the route there, and this description offers a level of specificity and detail that makes charting the path of the Argonauts extremely easy.

The same cannot be said of the path home, which is plagued with complications, and offers far fewer details.<sup>446</sup> The first problem is the fact that that, in contrast to earlier renditions of the story, the Argonauts do not take the same route they used to get there. Both Euripides and Pindar report that they simply sailed back out the Bosphorus and retraced their route home, and so Apollonius would have good literary precedent for making his Argonauts do the same. His reason for doing so will be explained later in this chapter, but instead, at the direction of Argus (the son of Athamas, not Argus the shipwright), they sail across the Black Sea, pursued by Apsyrtus, and enter the Ister (Danube). Apollonius glosses over the course of the ships across the Ister, except to

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<sup>445</sup> Rubio-Fernaz (1992), p. 37, Thalmann (2011), p.11. Delage (1930), p. 168. Moreau (2000) even posits specific prose sources that Apollonius is adapting, much like Aratus and Eudoxus.

<sup>446</sup> Delage (1930), pp.192-276. In general, there are far more errors in Apollonius' geography of the route home, as it depends on a number of details about the rivers of Europe that are untrue. The scholia attest that some of the information (such as the multiple mouths of the Ister) come from a work by Timagetus, see Clare (2002), p. 126, n. 18. I have not acknowledged places where Apollonius' picture of the world differs from reality, but they are numerous, especially about the connection between the Po, Rhine, and Rhone rivers.

explain that the river has two mouths, and that because the Argonauts use the northern mouth and the Colchians the southern, Apsyrtus gets ahead of them and is first to turn south and enter the Cronian Sea (the Adriatic), where he sets up camp to wait for them. Apollonius devotes only 44 lines to the trip from the moment the Argonauts receive a divine signal to take this path until they run into the Colchians in the Cronian Sea on the other side of Greece.

After the murder of Apsyrtus at the site of his ambush, the route gets even more complicated. They travel south down the Illyrian coast and come very close to the Peloponnese before they are blown back to the northernmost part of the Adriatic, and at the urging of their divinely-speaking mast, enter the mouth of the Eridanus (the Po). This river eventually connects with the Rhodanus (the Rhone), and they travel along it to the north, before eventually turning into a branch and sailing into the Mediterranean by the western coast of Italy. After this, the Argo sails along the western coast of Italy and through the Straits of Messina. In this leg of the journey they encounter (or sail past) most of the same people and monsters that Odysseus recounted in his wanderings in the *Odyssey* (Circe, Scylla and Charybdis, the Sirens, the Planctae, the island of the cattle of the sun, and the Phaeacians), some of whom Homer cites as features of the Argosy.

One might think that the Phaeacians are, as they were for Odysseus, the Argonauts' last stop before reaching home; but in fact, the heroes are once more blown off course just as the Peloponnese comes into view, and they wash up somewhere on the

northern coast of Africa.<sup>447</sup> From here, they portage their ship to the semi-mythological Lake Tritonis and the Garden of the Hesperides in the deserts of northern Africa, where, after propitiating Apollo, they find a channel of water that leads back to the Mediterranean. They sail by Crete (encountering Talos), before Apollo appears in an epiphany by Anaphe, just north of Crete; and then, after a brief stop in Aigina, they finally return to Iolcus, where, fittingly, the last word of the poem is “εἰσαπέβητε.”<sup>448</sup> The route home can therefore be divided roughly into thirds: their journey from Colchis through the rivers of Europe, the Argonautic version of the wanderings of Odysseus, and their somewhat fantastical voyage through Africa and the southern Mediterranean.

The return voyage of the trip is essential for the scope of the poem. Without it, the Argo would only sail along well-established shipping routes between mainland Greece and the Black Sea. Instead, the poem offers a tour of the majority of the *oikoumene*. The scale of the trip is made clear in the catalog, where Mopsus’ death in Libya is described as taking place “as far from the Colchians as the distance seen between the settings and the risings of the sun.”<sup>449</sup> This is not strictly accurate, but the line makes clear that the Argonauts are travelling the entire distance that the sun travels, and this also gives greater

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<sup>447</sup> Apollonius combines the Greater and Lesser Syrtes, two shallow gulfs on the North African coast that were notoriously troublesome for ships, into one geographical feature. The Greater is in modern-day Libya, the Lesser in modern-day Tunisia, see Thomson (1948), p. 68.

<sup>448</sup> A.R.4.1781.

<sup>449</sup> A.R.1.84-85: “τόσσον ἐκὰς Κόλχων, ὅσσον τέ περ ἡελίοιο/ μεσσηγὺς δύσιές τε καὶ ἀντολαὶ εἰσορόωνται.”



significance to their final adventure, where Apollo “rises up,” appearing to them on Anaphe much like the sun.<sup>450</sup>

It also takes the Argo on a tour of contemporary geographical thought. There were two major principles of dividing the *oikoumene* commonly used at that time. The first involved the three continents, Europe, Asia, and Egypt/Libya. When Argus suggests taking an alternate path back to Iolcos, he mentions a king who lived in even more ancient times, when “not yet did all the constellations revolve in the heavens.”<sup>451</sup> This king, coming from Egypt, “journeyed through all Europe and Asia,” a reference that nods to this division of the earth.<sup>452</sup>

The other method of organizing the planet divided the earth into four divisions, corresponding to each of the cardinal directions.<sup>453</sup> An equator ran through the middle of the Mediterranean.<sup>454</sup> Apollonius occasionally refers to how close his characters come to the edge of the *oikoumene*, and in these references, the influence of this system is clear. The first is Colchis itself, in the far east, which according to Jason, “lies near the boundary of Pontus and of the earth.”<sup>455</sup> The Ister, “the last horn of Ocean,” marks the northern limit of the earth, as Argus explains, and “its springs above the gusts of Boreas,

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<sup>450</sup> In fact, the poem has long been interpreted as a solar myth, see Noegel (2004). Bogue (1977), pp. 37-69, argues that Apollonius’ astronomical references throughout the poem show that the journey takes exactly a year, another circumnavigation of the earth by the sun.

<sup>451</sup> A.R.4.261: “οὐπω τείρεα πάντα, τά τ’ οὐρανῷ εἰλίσσονται”

<sup>452</sup> A.R.4.272-73: “πέριξ διὰ πᾶσαν ὀδεῦσαι/ Εὐρώπην Ἀσίην.” On this passage’s geography, Delage (1930), p. 21. See also Clare (2002), pp. 124-31.

<sup>453</sup> See Meyer (1998), pp. 210-215, on Timosthenes of Rhodes attempt to reconcile these two systems with his 12-pointed compass rose.

<sup>454</sup> That is, there were roughly equal amounts of land north and south of the Mediterranean. This was not considered the equator of the sphere of the Earth. See Thomson (1948), fig. 21; Roller (2010), pp. 25-27.

<sup>455</sup> A.R.2.417-18: “αἶα δὲ Κολχίς/ Πόντου καὶ γαίης ἐπικέκλιται ἐσχατιῆσιν.”

in the Rhipaean mountains far away boil up.”<sup>456</sup> The Rhipaean mountains represented a common border for the northernmost region of the earth, beyond which only the Hyperboreans lived, so that the Ister’s description is marked by three geographical markers, Ocean, the mountains, and the North Wind, that signify the absolute upper limit of the *oikoumene*.<sup>457</sup>

The third reference comes in the confusing section where the Argonauts travel from the Eridanus into the Rhodanus. Apollonius describes the Rhodanus, “stirred up from the farthest land, where the gates and shrines of Night lie, it belches forth onto the shores of Ocean.”<sup>458</sup> Here, the reference to Night and to the general direction in which they are travelling makes it clear that the Rhodanus pours out in the west. The Argo even almost sails into the Ocean, but Hera turns them back.<sup>459</sup>

The southern boundary of the Argonauts’ voyage comes during their adventure in Libya, where they land on the “innermost beach.”<sup>460</sup> The Argonauts carry their ship for twelve days, until they reach the garden of the Hesperides and the Tritonian Lake. The garden of the Hesperides is sometimes associated with the west, but always with the very edge of the *oikoumene*.<sup>461</sup> This is evident in Orpheus’ address to the Hesperides, “O nymphs, sacred race of Ocean.”<sup>462</sup> They have reached another limit of the earth, but it is clear here, from the directions they receive from the god Triton to return to the

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<sup>456</sup> A.R.4.282: “ὑπατον κέρασ Ὠκεανοῖο”; ARhod.4.286-87: “πηγαὶ γὰρ ὑπὲρ πνοιῆσ βορέασο/ Ῥιπαίοισ ἐν ὄρεσσιν ἀπόπροθι μορμύρουσιν.”

<sup>457</sup> Romm (1992), p. 65.

<sup>458</sup> A.R.4.629-32: “αὐτὰρ ὁ γαίησ/ ἐκ μυχάτησ, ἵνα τ’ εἰσὶ πύλαι καὶ ἐδέθλια Νυκτόσ,/ ἔνθεν ἀπορνύμενοσ τῆ μὲν τ’ ἐπερεύεταὶ ἀκτὰσ/ Ὠκεανοῦ.”

<sup>459</sup> A.R.4.638-44.

<sup>460</sup> A.R.4.4.1243-44: “μυχάτη... ἠτόνι”

<sup>461</sup> See Romm (1992), p. 69.

<sup>462</sup> ARhod.4. 1414: “ὦ νύμφαι, ἱερὸν γένος Ὠκεανοῖο”

Mediterranean, that they will travel in a north by northeast direction, placing this garden in the south/southwest. Thus the Argonauts come close to, but never actually reach, Ocean and the absolute farthest reaches of the *oikoumene* in each direction.

By outlining its limits, Apollonius gives us a good map of how he envisions the *oikoumene* to be laid out. He can be lacunose in his descriptions, and he completely avoids any mention of India, but, given the fragmentary state of Eratosthenes' *Geographika*, the *Argonautica* is the most complete picture of the earth that we have from the third century. Moreover, it offers a relatively coherent picture of the earth that 'solves' some difficult problems, like the route of the rivers of Europe, even if Apollonius' solution bears little relation to reality.<sup>463</sup> Apollonius' description of the *oikoumene* is straightforward, mostly well explained, and as detailed and specific as possible. It is also, however, two-dimensional. It is never clear in the poem how Apollonius imagines the *oikoumene* to be situated on the spherical earth, although it is unlikely that he believed the world was flat.<sup>464</sup> This is also an issue for Eratosthenes' spheroidal system, which has an equator through the Mediterranean, even though Eratosthenes was well aware of the sea's latitude.<sup>465</sup> It may be that 'ecumenical' and 'global' geographical discussions were not always compatible in this time period, given the lack of information about anything beyond the Ocean.

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<sup>463</sup> See Endsjø (1997), p. 374, on errors in Apollonius' understanding of the rivers.

<sup>464</sup> See Pendergraft (1991), where she argues for the scene in Book 3 of the *Argonautica* where Eros is depicted playing with a ball (A.R.3.132-41) has Aratean echoes that show it is cosmologically significant. She interprets the ball as the sphere of the cosmos, which may be a nod to a more three-dimensional image of the universe than the rest of the *Argonautica* presents.

<sup>465</sup> See Roller (2010), pp.

The first half of the poem, the outward journey, is a peripleutic, and marked by the prominent running motif of signs. Places are marked by their signs, which are linked to *aitia*, especially of monuments left by the Argonauts in places that they visited.<sup>466</sup> The Argo's trip serves as a transitional moment, not quite at the end of the heroic age, but near the end. The monuments show the links between the present and that past, while the fixity of the rocks at the Bosphorus show that that age is also irrevocably disconnected from the historic present.

The *Argonautica*, in fact, begins with Pelias recognizing a sign, when Jason arrives wearing only one sandal. The king has heard a “φάτις,” but it is unclear whether this should be translated as an “oracle” or a “rumor.”<sup>467</sup> Apollonius later refers to it as a “true utterance,” “ἔτεῖν βᾶξις,” another ambiguous term.<sup>468</sup> The authenticity of it is only confirmed because Pelias sees (ἔσιδών) Jason so quickly (δηρὸν δ' οὐ μετέπειτ) after he received the oracle/report.<sup>469</sup> Jason's sign also leaves a mark on the earth in the form of the sandal that he lost when crossing a river.<sup>470</sup>

This is the impetus for the trip, and the sign at the center of it reflects two important themes for Apollonius. The first of these is the ability of sight to confirm the truth of stories. Aratus often provides an aetiological story for his constellations, but it never represents proof of the story that stands behind it. In fact, he is careful to couch his

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<sup>466</sup> See Barnes (2003); Williams (1991), pp. 185-210; Hunter (1995b); Clauss (2000); Nishimura-Jensen (2000).

<sup>467</sup> A.R.1.5. Seaton (1912), p. 3, translates as “oracle.” Mooney (1964), p. 68, seems to imply that it means oracle but points out that in Homer it means “common talk amongst men.”

<sup>468</sup> A.R.1.8.

<sup>469</sup> A.R.1.15; 8.

<sup>470</sup> A.R.1.10-11.

aitiological stories in tentative disclaimers, such as “if the story is true.”<sup>471</sup> Apollonius never makes such a distinction and the historicity of the voyage of the Argo is maintained throughout. Instead, he uses the lasting traces of the Argonauts’ voyage as proof of this fact, such as the tree by Idmon’s tomb that is still visible today.<sup>472</sup> This is also related to the second important theme evident in Jason’s sandal, the impact of the Jason’s journey on the land itself. That is, Apollonius’ signs are proof of the narratives, and they are specifically tied to the earth.

Aratus’ signs are primarily directed at the future; they predict impending weather and the changing seasons. In contrast, Apollonius is mostly interested in signs in the landscape that point to the past, but prophecy and divination continue to play an important role throughout the poem. There are in fact not one but two prophets among the Argonauts, Mopsus and Idmon, one of whom (the latter) has already foreseen his death before the trip. Both seers are explicitly connected to Apollo, and Apollonius stresses Idmon’s knowledge of signs: “The son of Leto himself taught him prophecy—to take notice of birds and to see signs in burnt offerings,” and he foresees the successful conclusion of the voyage at their embarkation feast.<sup>473</sup> Mopsus also sees a sign that tells them to propitiate Rhea when they are stranded by storms by the Propontis.<sup>474</sup> In addition, Jason rebukes his worrying mother to, “not be an inauspicious bird for the ship.”<sup>475</sup> The most extended discussion of prophecy in the poem comes in the Phineas episode, where

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<sup>471</sup> *Phaen.*30: “εἰ ἐτεὸν δῆ,” referring to the story of the Bears. Ariadne’s Crown (*Phaen.*71-73) is the only such mythological story that contains no similar language. See Fakas (2001), pp. 164-71, on this.

<sup>472</sup> A.R.2.841-42.

<sup>473</sup> A.R.1.145-6: “Λητοΐδης αὐτος δὲ θεοπροπίας ἐδίδαξεν/ οἰωνοῦς τ’ ἀλέγειν ἢ δ’ ἔμπυρα σήματ’ ἰδέσθαι”; 1.440-47.

<sup>474</sup> A.R.1.1085-86.

<sup>475</sup> A.R.1.304: “μηδ’ ὄρνις ἀεικελίη πέλε νηί.”

Phineas' oracular talents are explained at length and he offers an extended prophecy for the Argonauts that includes the route they should take to Colchis.<sup>476</sup> Prophecy is always true, as is typical in poetry, and so unlike with Aratus' signs, Apollonius' signs do not always offer practical benefit. Pelias tries to avert his fate, and fails; Idmon and King Cyzicus accept their oracles, but both die because of them.

Phineas' speech makes the most direct link between the geography of the voyage and prophetic signs, but the relationship between the landscape and signs is established throughout the first two books, as the Argonauts make stops along their route to Colchis. Jason's sandal is only the first mark left on the earth by the Argonauts during their voyage. The most important change to the landscape is, of course, the cessation of the Clashing Rocks (the ones at the Hellespont), but Zetes and Calais, chasing the Harpies, change the "Floating Islands" to the "Turning Islands," possibly fixing them to a specific location in the process.<sup>477</sup> Most of the outgoing journey consists of episodes in which, when the Argonauts leave a place, a sign is left on the land there. Often this sign is an altar: they leave one to Apollo Aktius and Embasius before they leave Iolcos, to Apollo Ekbasios when they reach the Doliones, to Rhea at Mt. Dindymon, to the twelve Olympians in Thynia, to Apollo and Homonoia on an island they also name after Apollo, and to Castor and Polydeuces, (set up by the king Lycus).<sup>478</sup> Sometimes the name of the place changes because of their actions, as for Aphetae and the Floating islands.<sup>479</sup> Lyra

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<sup>476</sup> See Thalmann (2011), pp. 6-7.

<sup>477</sup> A.R. 2.296-97. See Nishimura-Jensen (2000); Clauss (2000).

<sup>478</sup> A.R.1.402-04; 966-67; 1123-25; 2.531-32; 694-95 and 718-19; 806-07.

<sup>479</sup> A.R.1.591; 2.296-97.

gets both a name change from the dedication of Orpheus' Lyre and a temple to Apollo.<sup>480</sup> Sometimes the story becomes an aition of an ethnographic practice, such as the Phrygians' worshipping Rhea, or the Mysians' still searching for Hylas.<sup>481</sup> Often the visibility of the sign is stressed, such as the wild olive tree that grows by Idmon's tomb: "it remains a sign for late-born men to see."<sup>482</sup> Heracles, we are told proleptically, will later set up two columns to commemorate exacting revenge on the twins Zetes and Calais, and one of the columns sways at the gust of their father Boreas, "a mighty wonder for men to look upon."<sup>483</sup> Each of these represents a trace of the Argonautic voyage on the places they visited, still observable today.

The relationship between signs in the landscape and poetry is made clear at the very beginning of the poem, in the description of Orpheus, which opens the Catalog of Heroes:

They say it was he who charmed the unyielding rocks on the mountains and the streams of the rivers with the sound of his songs. And wild oaks, signs of that song even still, blooming on the Thracian shores at Zone, stand close together in a row.

αὐταρ τόνγ' ἐνέπουσιν ἀτειρεάς οὔρεσι πέτρας  
 θέλξαι ἀοιδάων ἐνοπῆ ποταμῶν τε ῥέεθρα.  
 φήγοι δ' ἀγριάδες, κείνης ἔτι σήματα μολπῆς,  
 ἀκτῆς Θρηκίης Ζώνης ἐπι τηλεθόωσαι  
 ἐξείης στιχόωσιν ἐπήτριμοι. (A.R.1.26-30)

Orpheus' song leaves a literal mark on the land, a visible sign of the power, and consequently the authority, of song.

<sup>480</sup> A.R.2.927-29.

<sup>481</sup> A.R.1.1138-41;1351-56.

<sup>482</sup> A.R.2.842: "σήμα δ' ἔπεστι καὶ ὀπιγόνουσιν ιδέσθαι."

<sup>483</sup> A.R.1.1307: "θάμβος περιώσιον ἀνδράσι λεύσσειν."

Apollonius' signs are not the same as Aratus', but he uses them to connect his poetry to the *Phaenomena*.<sup>484</sup> The most prominent of these, the introduction of Tiphys in the catalog, demonstrates Apollonius' commitment to the educational value of poetry:

Tiphys, son of Hagnias, left from the Siphaeian land of the Thespians, talented at predicting the swelling wave on the broad sea and talented at marking the storms of wind and the path of the voyage by sun and by star.

Τῖφυς δ' Ἀγνιάδης Σιφαέα κάλλιπε δῆμον  
Θεσπιέων, ἐσθλὸς μὲν ὀρινόμενον προδαῆναι  
κῦμ' ἄλδος εὐρείης, ἐσθλὸς δ' ἀνέμοιο θυέλλας  
καὶ πλόον ἠελίῳ τε καὶ ἀστέρι τεκμήρασθαι. (A.R.1.105-08)

The primary allusion here is to Hesiod, whose own nautical expertise was famously derived from the Muses, in the mention of Thespis, the closest city to the poet's hometown Ascra.<sup>485</sup> However, the form Θεσπιέων, as Kidd has noted, is in the exact same sedes as it occurs in Aratus' own Hesiodic passage, the catasterism of the Horse, after it has struck Mt. Helicon and created Hippocrene.<sup>486</sup> Moreover, the description of Tiphys' knowledge better describes the content of the *Phaenomena* than the *Works and Days*. The passage makes a direct connection between Tiphys' skill, learning from poetry, and Aratus.

This connection between Tiphys and Aratus develops in the description of the launching of the Argo, which presents difficulties for the heroes. Selina Stewart has pointed out that the passage, in which the Argonauts dedicate an altar to Apollo Aktius (as a sign), contains an acrostic of “ἄκτια,” which is too thematically relevant to be

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<sup>484</sup> On Aratean allusions in the *Argonautica* more broadly, see Hurst (1967), p. 40, n.3; Fraser (1972), pp. 635-36; De Marco (1963), pp. 350-52; Claus (1993), pp. 18-19.

<sup>485</sup> Hes.*Op.*646-62. See Rosen (1990) on the metapoetic significance of this passage.

<sup>486</sup> *Phaen.*223. Kidd (1997), p.263, points out the connection between these two references to the Thespians, but does not discuss it.



plausibly accidental.<sup>487</sup> I believe that this acrostic offers an intricate allusion to Aratus. It is introduced by two references to Tiphys, one in which he jumps onto the ship to guide the heroes, and the other in which he is entrusted with the ship once it is launched.<sup>488</sup> Moreover, the line immediately before the acrostic begins with the Aratean thematic word, “σημανέειν.”<sup>489</sup> Immediately before this, Apollonius provides a small reference to the Argo constellation. The ship is sliding into the sea too quickly, and the heroes have to drag it backward.<sup>490</sup> As Patricia Bogue has suggested, this recalls the metaphor in Aratus’ description of the Argo constellation, which moves across the sky with its prow facing backwards, as if being dragged to shore.<sup>491</sup> This cluster of Aratean references cements the connection between signs, Tiphys, and the ability to recognize signs from poetry.<sup>492</sup>

Apollonius thereby invites the reader to see the *Argonautica* in a tradition of epic poetry that includes Aratus, and demonstrates, in Tiphys, the authority that poetry conveys. In the process, perhaps, he invites the reader to look for the hidden signs in his own poem. In an unpublished dissertation, Bogue charts the astronomical and meteorological references in the *Argonautica* and argues convincingly that these represent a coherent set of signs that mark a year, perhaps tying into the connections of

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<sup>487</sup> A.R.1.415-19. Stewart (2010). The word is repeated twice beforehand, at 1.403; 404.

<sup>488</sup> A.R.1.381-82; 400-01.

<sup>489</sup> A.R.414.

<sup>490</sup> A.R.1.390-91.

<sup>491</sup> *Phaen.*343-48. Bogue (1977), p. 19.

<sup>492</sup> The first two books are structured very similarly to Aratus’ *Phaenomena*. Apollonius breaks up long passages of technical geographical detail with mythological episodes, much like Aratus inserts catasterisms into his star catalog. Tiphys dies shortly before they reach Colchis (A.R.2.854-55), and the remainder of the *Argonautica* has little in common structurally with the *Phaenomena*.

the Argo to solar mythology.<sup>493</sup> The astute reader, who, like Tiphys, has learned from the poets, will notice the signs and see that narrative coheres both geographically and chronologically. Apollonius' use of signs and his Aratean references point to the signs in the poem that reveal its internal consistency, strengthening his later claims about Homeric geography.

This is the main topic of the final book of the poem: the location of the wanderings of Odysseus.<sup>494</sup> This was a topic of great interest to both authors working exclusively on geography (Eratosthenes, Hipparchus, Polybius, and Strabo all wrote about it), and scholars of Homer and philology (Callimachus, Aristarchus, Apollodorus, and Crates of Mallos). The second leg of the Argo's return voyage gives Apollonius the opportunity to make his own position on the subject very clear. There were two camps in this debate. By the second century BCE, these camps were very neatly divided, ideologically, philosophically, and even geographically. In Alexandria, Aristarchus of Samothrace and his pupil Apollodorus devised a theory of "*exokeanismos*." They claimed that after he rounded Cape Malea, Odysseus was blown out into the Ocean, and therefore, the places he visited are impossible to map.<sup>495</sup> The evidence is very fragmentary, but Apollodorus seems to have believed that an historical Odysseus took a real journey

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<sup>493</sup> See Bogue (1977); and especially Noegel (2004).

<sup>494</sup> Menelaus' wanderings are the other key Homeric issue, but the travels of Jason were also an important issue, although the evidence for the argument is much more fragmentary, see Str.1.1.19, and also Kim (2007); West (2005).

<sup>495</sup> Romm (1992), pp. 187-88.

within the Mediterranean, but that Homer relocated it to take place in the Ocean, so that he could make it more fantastic.<sup>496</sup>

Romm has suggested that Aristarchus and Apollodorus were inspired by Eratosthenes' own ideas on the subject, even in their terminology, because Eratosthenes wrote that Homer "elected to push each thing (ἕκαστα ἐξάγειν) to the more wondrous and the more prodigious."<sup>497</sup> This is possible, but there is an important distinction between their positions. Eratosthenes' comment about the cobbler who sewed the bag of winds suggests that he viewed the entire issue as preposterous and irrelevant because the entire poem was fiction. Within the group of 'Homer skeptics,' therefore, there is a spectrum of faith in the geographical and historical reality of Homeric epic, where Apollodorus sees a real journey, resituated in the Ocean, and Eratosthenes discounts the truth behind the poem completely.

The same diversity of opinions occurs in the opposite camp of those who attempted to chart the sites of each particular episode. Crates of Mallos, who worked at the Library in Pergamon at roughly the same time as Aristarchus, seems to have been the most devout believer in the reality of Homeric epic, and in fact charted all of Odysseus' trip on his own globe, using Books 9-12 of the *Odyssey* as evidence for the geography of the Ocean.<sup>498</sup> More common were attempts to locate places within the Mediterranean to match these episodes. Strabo gives us most of our evidence for this, but even he allows that Homer included some myths in his work, and states that there are always

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<sup>496</sup> Romm, (1992), pp. 186-87.

<sup>497</sup> Str.1.2.19: "προελόμενον...ἐπὶ τὸ δεινότερον καὶ τὸ τερατωδέστερον ἕκαστα ἐξάγειν" See Romm (1992), pp. 186-87.

<sup>498</sup> Romm (1992), pp. 188-89; Pfeiffer (1968), pp. 238-41, on Crates' Homeric geography more generally.

inconsistencies between the details as reported in the poem and the geographical knowledge of his time. He comes up with many ingenious ways of explaining away these difficulties, but he seems more willing to accept a certain amount of fiction in Homer than Crates was.<sup>499</sup> Crates is the most influential figure on this side of the debate, and his and Strabo's open affiliation with Stoicism allow him to make a claim that this was a specifically Stoic way of interpreting Homer. The positions of each of these figures suggests that the debate was in part about the historicity of Homer's poems, in part about the competing status of the libraries in Pergamon and Alexandria, and in part about the difference in philosophical approaches between the two schools.

This cleanly divided picture of rationalist scholars in Alexandria and mystical Stoic allegorists in Pergamon does not hold for the third century, when Stoic philosophy was still in development and the Library at Pergamon did not yet exist. All sides of the argument were represented in Alexandria, by Callimachus, Apollonius and Eratosthenes.<sup>500</sup> The evidence for Callimachus' position is unfortunately very slim, but we do know that he attempted to locate some Homeric places, such as Ogygia and Scheria, within the Mediterranean.<sup>501</sup> Although it is difficult to determine whether Apollonius was responding to Eratosthenes' argument or vice versa, it seems undeniable that the two successive heads of the Library were in dialog about this issue, and strongly opposed to one another.

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<sup>499</sup> See, for example, Str.1.2.36, where he explains the thrice-daily eruption of Charybdis by suggesting that there were three tides a day in Homer's time.

<sup>500</sup> Callimachus' positions are not discussed much in this chapter, but it is clear that he did locate the wanderings of Odysseus in western Mediterranean, although not always in the same places as Apollonius and other scholars, see p.157.

<sup>501</sup> As recorded in Str.7.3.6.

Apollonius makes his position very clear by specifying the intra-Mediterranean geographical placement of most of the locations mentioned in *Odyssey* 9-12.<sup>502</sup>

Apollonius' Argonauts encounter, in order, Calypso's island, Circe, the Sirens, Scylla and Charybdis, the island of the Cattle of the Sun, and the Phaeacians, all in the area around western Italy.<sup>503</sup> In fact, Apollonius clearly rejects any exokeanismos in the episode immediately preceding this leg of their journey, when the Argo almost enters the Ocean from the Rhodanus:

A particular branch of the river carried them into the bay of Ocean, which they, unsuspecting, were about to enter, from which they would never have returned and been saved. But Hera cried out from the Hercynian lookout, leaping down from the heavens. And all of them alike shook with fear of her, for the mighty sky shook terribly. But they were turned back by the goddess, and they made note of the path by which their return would come to be.

φέρει γάρ τις ἀπορρῶξ  
κόλπον ἐς Ἰκεανοῖο, τὸν οὐ προδαέντες ἔμελλον  
εἰσβαλέειν, τόθεν οὐ κεν ὑπότροποι ἐξεσάωθεν.  
ἀλλ' Ἥρη σκοπέλοιο καθ' Ἐρκυνίου ἰάχησεν  
οὐρανόθεν προθοροῦσα: φόβῳ δ' ἐτίναχθεν αὐτῆς  
πάντες ὁμῶς: δεινὸν γὰρ ἐπὶ μέγας ἔβραχεν αἰθήρ.  
ἄψ δὲ παλιντροπόωντο θεᾶς ὑπο, καί ῥ' ἐνόησαν  
τὴν οἶμον, τῆπέρ τε καὶ ἔπλετο νόστος ἰοῦσιν. (A.R.4.637-644)

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<sup>502</sup> There is no explicit mention of the Laestrygonians, the island of the Cyclopes (unless it is the same as the island of Cattle of the Sun), the Lotus Eaters, or the Katabasis. Of course, all of these episodes are alluded to in numerous places in the poem, see Knight (1995), pp. 122-266, but no geographical reference point is given for their locations.

<sup>503</sup> Except Ogygia, the home of Calypso, which is on the other coast in the Ionian Sea (4.574-75), see Knight (1995), pp. 220-222. It is possible that Apollonius distances this place from the others because Homer's account of Odysseus' time there is separate from the rest of the wanderings.

The double meaning of οἶμος here is very evident; the Argonauts do not just make note of their path, but also the appropriate song, and that is not one that takes place in the Ocean.<sup>504</sup>

The intricate river path of the Argo that takes it from Colchis in the far east to the western region of the Mediterranean is in part a device that Apollonius needs to ‘solve’ one of the problems he faced in correlating the travels of the Argo and the wanderings of Odysseus. Aieetes has always been associated with Colchis in the east, but the location of Circe’s home has always been a bit imprecise. As Aieetes’ sister and the daughter of Helios, an eastern location seems logical, though Hesiod states that her children (by Odysseus) rule over the Tyrrhenians.<sup>505</sup> But in the *Odyssey*, Circe famously aligns Odysseus’ journey with the Argosy, suggesting that it occurs in the same region of the sea. The wanderings of Odysseus are associated with Italy and the western Mediterranean from the fifth century at least, and may even represent a kind of proto-oxokeanismos that located them in an area that was less well known to Greek sailors.<sup>506</sup> Apollonius resolves the inconsistencies by means of the Danube interlude in his Argosy, taking the Argonauts from the far east to the far west, and by making a distinction between Aia, a city near Colchis, and Aiaia, the place where the Argonauts visit Circe, in Tyrrhenia.<sup>507</sup> These two decisions enable Apollonius to maintain consistency with all of

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<sup>504</sup> Romm (1992), pp. 195-96, tentatively connects this with the Homeric geography debates, but I think it is less doubtful, especially considering the use of οἶμος. See also Albis (1996), pp. 115-117, on the significance of this word, especially in Book 4.

<sup>505</sup> Hes. *Th.* 1011-16.

<sup>506</sup> See Casson (1991), pp. 61-80, on Greek knowledge of the western Mediterranean over time. Thucydides (Thuc. 6.2.1) claims that Sicily was the home of the Cyclopes and the Laestrygonians.

<sup>507</sup> Aia is used frequently in the poem as identical to Colchis A.R. 2.417; 422; 1094; 1141; 1185; 1267; 3.306; 1061; 4.131; 255; 277; 278. Aiaia is mentioned only after they leave Colchis at A.R. 4.661; 850.

the archaic evidence for these journeys, while still presenting a coherent route for the Argonauts.

By the Roman period, specific geographical features had been firmly connected with some specific episodes from the *Odyssey*. Most famously, the Straits of Messina between Sicily and Calabria in mainland Italy were believed to be Scylla and Charybdis.<sup>508</sup> But even in Strabo's day, there was still debate about the precise location of each episode:

For example, I say, when someone asks whether the wandering occurred around Sicily and Italy and whether the Sirens are said to be somewhere around there, then the person saying that they are on Pelorias disagrees with the person saying they are on the Sirennussae, but neither of them disagrees with the person saying they are around Sicily and Italy, and in fact, they offer greater proof because although they are not pointing to the same place, nevertheless, they do not contradict the one saying the Sirens are around Italy and Sicily.

οἷον λέγω, ζητουμένου, εἰ κατὰ Σικελίαν καὶ Ἰταλίαν ἢ πλάνη γέγονε, καὶ εἰ αἱ Σειρήνες ἐνταῦθά που λέγονται, ὁ μὲν φήσας ἐν τῇ Πελοριάδι πρὸς τὸν ἐν ταῖς Σειρηνούσσαις διαφωνεῖ, ἀμφοτέροι δὲ πρὸς τὸν περὶ Σικελίαν καὶ Ἰταλίαν λέγοντα οὐ διαφωνοῦσιν, ἀλλὰ καὶ μείζω πίστιν παρέχουσιν, ὅτι, καίπερ μὴ τὸ αὐτὸ χωρίον φράζοντες, ὅμως οὐκ ἐκβεβήκεσάν γε τοῦ κατὰ τὴν Ἰταλίαν ἢ Σικελίαν.<sup>509</sup>

We must assume that there was a great deal more debate in the third century, when these ideas were beginning to be collected and discussed seriously. Callimachus, according to Strabo, located Calypso's island at Gaudus (modern day Gozo, near Malta), whereas Apollonius places it in the Adriatic Sea.<sup>510</sup> Apollonius' decision to place specific

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Circe is referred to as "Aiaian" at A.R.4.559, although this epithet could come from her association with either of these places. See also Lesky (1948).

<sup>508</sup> See Str.1.2.36.

<sup>509</sup> Str.1.2.13. Strabo goes on to mention a third possible location in Naples after this, in support of his claim that the discrepancies strengthen the argument that it occurred somewhere in the region.

<sup>510</sup> Str.1.2.37, see note in Jones (1917), *ad loc.* In the *Argonautica*, they sail past the island, which Apollonius calls Melite, A.R.4.574.

Homeric locations where he does should not be thought of as conventional wisdom, but as an argument in an ongoing debate.

One example of Apollonius' engagement with Homeric geography is his placement of Circe's home, Aiaia, on the west Italian mainland. Circe's connection to Tyrrhenia, as mentioned above, goes back to Hesiod, but in the *Odyssey*, Homer says that she lives on an island. Apollonius describes it as "the Aiaian shore of the Tyrrhenian mainland," leaving little doubt of his opinion on the matter.<sup>511</sup> In all instances, he makes clear that Aiaia is not an island, either using "ἤπειρος" or referring to Ausonia or Tyrrhenia.<sup>512</sup> Scholars since antiquity have considered this a reference to Monte Circeo, a promontory in the region that juts out far enough to be easily mistaken for an island, but that is not made clear in the poem.<sup>513</sup> It is evident that Apollonius wants to leave no confusion that Circe's home is on the mainland. He even calls attention to the opposite opinion, voicing it through Medea, who describes "Αἰαίης νήσου," during her nighttime tryst with Jason.<sup>514</sup> Immediately afterward, she refers to another aunt of hers, Pasiphae, and asks for information about her daughter Ariadne, whom Jason has just mentioned obliquely.<sup>515</sup> We should therefore read these two statements as connected, demonstrating the naïveté of Medea that is apparent throughout Book 3. Her knowledge of her own family is sketchy at best. She has heard of her aunts, but she does not know the story of her cousin Ariadne and she is misinformed about Circe's home. In contrast, Aieetes

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<sup>511</sup> A.R.4.850: "ἄκτῆν Αἰαίην Τυρσηνίδος ἠπείροιο," cf. 3.311-13; 4.659-61; 4.856. The fact that the line is only four words calls attention to his geographic decision.

<sup>512</sup> Knight (1995), pp.185-86.

<sup>513</sup> Σ ad *Od.*10.135. Knight (1995), p. 186; Phillips (1953), pp. 55-56.

<sup>514</sup> A.R.3.1074. Jason does the same in his response at 3.1093, although we might attribute this to his assumption that Medea's knowledge of her aunt's home would be correct.

<sup>515</sup> A.R.3.1074-76.



makes no such error.<sup>516</sup> Apollonius gives his own account of the location of Aeaea and acknowledges other positions on the subject in such a way as to further his other narrative goals, such as the characterization of Medea.

One other episode in this section deserves particular mention for the interesting way that it relates to debates about Homeric geography in the third century. In his description of the Cattle of the Sun, Apollonius seems to be in a dialog with Archimedes.<sup>517</sup> Archimedes' place in a chapter on poetry and geography may seem surprising. He is remembered as an inventor, by those familiar with the anecdotes about his life, and as a mathematician, by those who have read his surviving treatises.<sup>518</sup> There is one poem attributed to Archimedes, the *Cattle Problem*, a poem of 44 lines in elegiac couplets.<sup>519</sup> This poem contains a complicated math problem asking the reader to calculate the number of the cattle of the Sun, creating seven equations with eight unknowns. The cows are divided into four groups on the basis of their coloring, and then subsequently divided by sex. After the publication of the manuscript in 1773, Archimedes' problem remained unsolved for over a hundred years.<sup>520</sup> In fact, it has an infinite number of answers, and even the smallest integer solution is still incredibly large.<sup>521</sup> Another work by Archimedes, the *Sand Reckoner*, also dealt with extremely

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<sup>516</sup> A.R.3.311-13. See Knight (1995), p. 186.

<sup>517</sup> On their relative chronology, see Knight (1995), p. 218. It is possible for either one of them to be writing first, although Apollonius probably was a little older.

<sup>518</sup> See Jaeger (2008); Netz (2009).

<sup>519</sup> On issues of attribution, Fraser (1972), p. 402, is perhaps the recent scholar most skeptical of the authenticity, but he acknowledges a long historical tradition of associating this problem with Archimedes. It is worth noting that the introduction to the poem, quoted below, does not necessarily say that Archimedes composed it, see note 523 below on the text of the poem.

<sup>520</sup> Amthor (1880) solved the problem. See also Vardi (1998).

<sup>521</sup> Vardi (1998), p. 8, expresses the answer in the form of the equation.

large numbers, and so one can see that Archimedes had a particular interest in finding the most elegant way of expressing such quantities.<sup>522</sup>

The poem, according to the anonymous introduction in the manuscript, was a problem, “that Archimedes devised (εὐρὼν) in epigrams for the Alexandrians busying themselves about these things and sent it in a letter to Eratosthenes.”<sup>523</sup> It is part of a tradition that includes another mathematical poem attributed to Eratosthenes about doubling a cube.<sup>524</sup> It is unclear, in the introduction to Archimedes’ poem, precisely what the Alexandrians were “busying themselves” about, but most scholars have assumed that Archimedes sent his poem upon hearing of Eratosthenes’ accomplishments in doubling the cube.<sup>525</sup> It is therefore a challenge, albeit a friendly one, to a rival, daring him to prove his mathematical acumen. This introduction is somewhat suspect, of course, but the difficulty of the problem suggests that the authorship is correct. There are few other figures in the history of mathematics who could have devised this problem (it is unknown whether he solved it), and Archimedes’ other works, as stated above, show a marked interest in extremely large numbers, which this poem requires.

The *Cattle Problem* is relevant for this chapter not for its mathematics, but because of the set-up to the problem that Archimedes gives. Although the poem has been

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<sup>522</sup> See Netz (2009), pp. 56-58, on this interest in large numbers in the Hellenistic Period.

<sup>523</sup> Text from Lloyd-Jones and Parsons (1983), 3.170: “ὅπερ Ἀρχιμήδης ἐν ἐπιγράμμασιν εὐρὼν τοῖς ἐν Ἀλεξανδρείᾳ περὶ ταῦτα πραγματευομένοις ζητεῖν ἀπέστειλεν ἐν τῇ πρὸς Ἐρατοσθένην τὸν Κυρηναῖον ἐπιστολῇ.” For εὐρίσκω meaning ‘to devise, invent,’ LSJ s.v. εὐρίσκω A.III. This allows the dative participial phrase to be a dative of reference, eliminating the double addressees of the letter.

<sup>524</sup> Text from Powell (1925), fr.35. According to Plutarch, Plato posed the problem to Archytas, Eudoxus, and Menaechmus, who created a mechanical solution, which displeased Plato, because it was not based on pure geometry. See van der Waerden (1954), pp. 139-41. Eratosthenes is rather vague about how exactly his own device works, but he references all three mathematicians in it, and dedicates the poem to Ptolemy. On this poem, and its connection to the Cattle Problem, Netz (2009), pp. 56-58.

<sup>525</sup> Fraser (1972), pp. 407-08.

discussed primarily within the context of the history of mathematics, it offers an important commentary on the debates about Homeric geography. The poem begins:

Measure, oh friend, the number of the cattle of the Sun, fixing your thoughts upon it if you have a share of wisdom: how many were the groups, divided into four, that once grazed in the fields of Sicily, the Thrinacrian island, wandering over the grass?

Πληθὺν Ἡελίοιο βοῶν, ὃ ξεῖνε, μέτρησον  
φροντίδ' ἐπιστήσας, εἰ μετέχεις σοφίης,  
πόσση ἄρ' ἐν πεδίοις Σικελῆς ποτ' ἐβόσκετο νήσου  
Θρινακίης τετραχῆ στίφεια δασσαμένη  
χροιὴν ἀλάσσοντα· (Archim.*Bov.*1-5.)

Archimedes, writing in Syracuse, specifically ties the Homeric setting to his home and includes a reference, in the pleonastic Θρινακίης, to the etymological/geographical argument that Thrinacia in the *Odyssey* is definitely Sicily, because it is a three-cornered island.<sup>526</sup> He then sent the poem to his friend and rival, the person most notorious for rejecting this and all similar arguments about Homer. The setting is unnecessary for the math problem itself, and therefore was probably included specifically because of Eratosthenes' famous skepticism about the issue. The poem shows that the debate about Homer and geography, and the dissent in Alexandria about it, was known around the Mediterranean, already in the third century BCE.

Moreover, Apollonius may actually allude to this poem in the *Argonautica*. The cattle of the Sun only appear briefly in the poem. In the *Odyssey*, this episode is so important that it is mentioned in the proem to the epic, and Apollonius' decision to avoid it is probably intentional, to contrast the Argonauts' voyage with that of Odysseus. The

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<sup>526</sup> See Netz (2009), pp. 166-67, who suggests that Archimedes is demonstrating, by the incredibly large number of the answer, "that Sicily's power was indeed immeasurable."

boat sails by the island very quickly, in just fourteen lines, most of which describe the daughters of Helios, Phaethusa and Lampetia, tending the herds. This is the only glimpse of the island in the *Argonautica*, and one of the few details offered is of the coloring of the cows: “nor was the body of any among them dark (κυανέη), but all resembled milk (γάλακτι), glorying in golden horns.”<sup>527</sup> This connects directly with Archimedes’ set-up of the variously-colored cows. In fact, there are even verbal similarities between the two poems, as Virginia Knight has noted. Apollonius’ line begins with “κυανέη” and ends with “γάλακτι,” whereas Archimedes has “... γάλακτος/κυανέω...” in his poem.<sup>528</sup> These echoes make it clear that the two poems are related.

The question of which poet is reacting to the other, however, is problematic. It makes much more sense that Archimedes, for whom this is the only poem extant or attested, would quote Apollonius, a much more prominent poet. And, as stated above, chronologically, Apollonius is probably slightly older, although their two careers overlap.<sup>529</sup> The chronology is further complicated by Eratosthenes’ position relative to both Apollonius and Archimedes. If the poem was actually sent to Eratosthenes, he either established his views on locating the wanderings of Odysseus before he wrote the *Geographika* (which Geus believes was composed after he took the position of Head Librarian, and therefore probably after the composition of the *Argonautica*), or the *Cattle*

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<sup>527</sup> A.R. 4.976-78: “οὐδέ τις ἦεν/ κυανέη μετὰ τῆσι δέμας, πᾶσαι δὲ γάλακτι/ εἰδόμεναι, χρυσεῖοισι κέρασσι κυδιάσκον.”

<sup>528</sup> A.R.4.987; There are also possible echoes in Apollonius’ “Θρινακίης” (4.965;994, both in the same sedes as Archimedes and “ὄμπιον” (4.989). See Knight (1995) pp. 217-18, esp. n. 295.

<sup>529</sup> Although Murray (2012) discusses the fact that Apollonius’ are typically pushed up because of the papyrological evidence that she does not find convincing, so it is possible we are wrong for thinking he was older than Archimedes.

*Problem* is the last of the three works.<sup>530</sup> And yet the detail of the cows' color does not serve any purpose in *Argonautica*, and Homer did not mention the color of the cows at all. It is difficult to conceive of another reason why Apollonius would include this detail if it were not an allusion to Archimedes. In contrast, the variety of colorings of the cows was the actual point of Archimedes' poem, making it much more germane to his work. If Apollonius is referencing Archimedes, then it is clear that Apollonius' Homeric geography is a direct response to Eratosthenes' opinion on the subject. If, conversely, Archimedes is alluding to Apollonius, then it may represent an extra 'twist of the knife' in his challenge to his rival. Either way, the *Cattle Problem* strengthens the likelihood that the *Argonautica* and the *Geographika* are responding to each other, specifically addressing the question of Homer's role in the study of geography.

The number of uncertainties about this poem and its relation to Eratosthenes and Apollonius make it difficult to make any definite assertions. If Apollonius was responding to Archimedes, perhaps including the detail of the all-white herd, which obviates the problem, was his own, not particularly difficult, way of solving a very difficult mathematical problems. But in any case, it is clear that the question of identifying the locations of the wanderings of Odysseus held wide interest and worked its way into a diverse set of texts. Apollonius' *Argonautica* offers an argument in an ongoing debate within the field of geography.

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<sup>530</sup> See Geus (2002), pp. 56-57.

#### IV. Geographical Narrative in the *Argonautica*

The *Argonautica* offers a fairly comprehensive depiction of the *oikoumene* and weighs in contentious issues, especially ones related to Homeric geography. Apollonius' interests in the subject are influenced heavily by the scholarly study going on at the Library at the time.<sup>531</sup> But he is still a poet, and as was the case for Aratus, his interest in science also affects his poetics. In the following, I will attempt to consider how Apollonius, writing an epic poem modeled on Homer, conceives of his relationship to his predecessor, in both Homer's role as poet and as geographer, in a cohesive fashion.<sup>532</sup>

One example involves Apollonius' catalog of the heroes. Apollonius' prologue transitions immediately into the catalog, and the early position of the catalog has been discussed extensively. Most scholars believe that Apollonius pushes his catalog to such an early point in the poem so that it does not break up the narrative later on.<sup>533</sup> The very careful order of the catalog has also been long acknowledged. This list comprises two balanced halves, begun respectively by Orpheus and Heracles, which contain relatively equivalent sets of heroes.<sup>534</sup> The first half includes Tiphys, the first helmsman, and Mopsus, the prophet who dies in Book 4.<sup>535</sup> The second half, marked by Heracles'

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<sup>531</sup> See Cusset (1999).

<sup>532</sup> Apollonius' relationship to Homer has been the subject of a great deal of bibliography, although almost all of it is focused exclusively on the 'poet' side of the question, and does not address Homer's larger position in society. See especially Knight (1995); Clare (1993); Beye (1982); Lennox (1980); Campbell (1983); Carspecken (1952); Seaton (1891). On Apollonius' poetry, as it was affected by his Homeric scholarship, see Rengakos (2001); (1994); (1993); Bollack (1975); Giangrande (1967); Erbse (1953).

<sup>533</sup> Händel (1963), p. 15. See also Clauss (1993), p. 26, who thinks beginning with the catalog would be considered "an auspicious starting point for the poet."

<sup>534</sup> This and the following are demonstrated in Clauss (1993), pp. 30-32.

<sup>535</sup> A.R.1.105-114; 65-66.

introduction, also contains a prophet, Idmon, who dies in Book 2, and the helmsman who takes over after Tiphys' death, Ancaeus.<sup>536</sup> The two evenly matched halves have been compared to the balanced structure of the second half of the *Aetia*, which begins with Berenice's victory and ends with the catasterism of her lock of hair.<sup>537</sup> The catalog has a further structural conceit, however. The heroes are listed in an order based on their hometown, moving geographically in a circle from Orpheus in Thrace, down the eastern coast of mainland Greece, through the Peloponnese and back north, ending with Argus the shipwright and Acastus, King Pelias' son, from Iolcos.<sup>538</sup>

This overall pattern may actually be another sign of the influence of Aratus on the poem. The *Phaenomena* offers the most definite example of an earlier poet structuring his catalog in a coherent fashion, and, like Apollonius' catalog heroes, Aratus' catalog of the fixed constellations is arranged spatially.<sup>539</sup> The catalog began at the most northerly point, the Bears and the Dragon, and moved south in wedge-shaped bands. That is, Aratus' catalog uses a central point and moves out from it, whereas Apollonius adopts a simpler circular format, but, given the influence of the *Phaenomena* on the *Argonautica*, it would not be surprising if Apollonius developed this technique from the earlier poet.

The combination of the bipartite and overall structural arrangements brings to the fore the intertwined relationship of Apollonius' narrative and his geographical scholarship. The helmsmen are listed in the order in which they guide the ship (first Tiphys, then Ancaeus), whereas the prophets are reversed (Mopsos is introduced before

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<sup>536</sup> A.R.1.122-32; 139-41; 163-65.

<sup>537</sup> Roth (2004); See also DeForest (1994), p.41.

<sup>538</sup> Delage (1930), pp. 38-39, is the first to point this out.

<sup>539</sup> There is also an organization to the weather signs, see pp. 73-74 and Kidd (1997), pp. 438-39.

Idmon, who dies first). In addition, the geographical pattern both simulates the path of the Argo by beginning and ending in northeastern Greece, but also inverts it. The Argo travels, very roughly, north and east, then west, south, and finally northeast again. The catalog of heroes moves south, west, north, and finally east, moving clockwise where the Argo went counter clock-wise. Narrative and geographical space imitate and reverse one another.

The catalog itself is an important place for Apollonius to establish his relationship with his Homeric model, but also his departure from it. The geographical arrangement, or lack thereof, in Homer's Catalog of Ships was a topic of interest in Homeric scholarship. This is attested in the scholia, although the surviving evidence postdates the *Argonautica*. Nevertheless, it is hard to believe that this was not already an issue in Apollonius' time. The scholia include a quotation of Aristarchus, whose floruit came not much after Apollonius' career. While addressing the possible reason Homer began the Catalog of Ships with the contingent from Boeotia, the scholiast writes, "But Aristarchus says 'he [sc. Homer] began with the Boeotians on impulse. If he had begun with another tribe, we would search for the reason for the beginning.'" <sup>540</sup> Aristarchus' frustration suggests that the debate had gone on for some time, and so we can presume Apollonius was also involved in this argument. One theory circulated that Homer began his catalog

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<sup>540</sup> Σ (D) ad. *Il.*2.494: "ὁ δὲ Ἀριστάρχος φησὶν 'κατ' ἐπιφορὰν αὐτὸν ἀπὸ Βοιωτῶν τὴν ἀρχὴν πεποιῆσθαι; εἰ γὰρ καὶ ἀπ' ἄλλου ἔθνους ἦρξατο, ἐζητοῦμεν ἂν τὴν αἰτίαν τῆς ἀρχῆς.'" Translation from Nünlist (2009), p. 182



in Boeotia to pay homage to the Muses of Mt. Helicon, and Apollonius begins his catalog with Orpheus, which is probably a nod to that theory.<sup>541</sup>

The geographical arrangement of Apollonius' catalog is another example of this. Homer's catalog is not coherently or systematically organized into geographical framework.<sup>542</sup> This was acknowledged in antiquity, but both Strabo and, before him, Hipparchus went out of their way to excuse the geographical inconsistencies: he may not put the cities in order, but he does organize Menelaus' account of his wanderings geographically:

And in the catalog [of ships], he does not give the cities in order, for it is not necessary. But he gives the races in order, and equally so for those from far away: 'After wandering in Cyprus, Phoenicia, and Egypt, I came to the Ethiopians, and the Sidonians, and the Erembians and Libya.' [Od.4.83] Hipparchus also made note of this.

καὶ ἐν τῷ καταλόγῳ τὰς μὲν πόλεις οὐκ ἐφεξῆς λέγει· οὐ γὰρ ἀναγκαῖον· τὰ δὲ ἔθνη ἐφεξῆς. ὁμοίως δὲ καὶ περὶ τῶν ἄποθεν· Κύπρον Φοινίκην τε καὶ Αἰγυπτίους ἐπαληθεῖς Αἰθίοπας θ' ἰκόμην καὶ Σιδονίους καὶ Ἐρεμβοὺς καὶ Λιβύην. ὅπερ καὶ Ἰππαρχος ἐπισημαίνεται. (Str.1.2.20)

Both Strabo and Hipparchus are arguing against Eratosthenes and attempting to support the claim that Homer was a geographer, and therefore this argument about the catalog probably stretches back to the mid-third century BCE. Apollonius' arrangement of his catalog of heroes is also probably informed by this debate. It offers, in miniature, a representation of the way geography, Homer, scholarly debates on both, and the narrative of the *Argonautica* interrelate in dynamic, complex ways. I would suggest that

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<sup>541</sup> Nünlist (2009), pp. 181-83. Σ ad *Il.*2.494.

<sup>542</sup> Roth (2004), p. 45, n.11, claims otherwise, and most of the Catalog of Ships follows a fairly straightforward geographical, but there are major exceptions, such as when he shifts abruptly from the Aetolians to Crete (*Il.*2.644-45). Moreover, the immediately following Strabo quotation (Str.1.2.20) shows that this was believed by the Homeric geographers.

Apollonius frontloads his catalog not only to keep it from breaking up the narrative but also to introduce the way these different themes are interacting with each other throughout the poem .

The ship was a common metaphor for poetry, and Apollonius uses this conceit to play with the relationship between the path of the Argo and the poetic tradition that it follows. He uses the word “οἶμος” six times, all in Book 4. The word always means the path or route the ship will follow, but it has larger metapoetic meaning as well, echoing the “οἶμος ἀοιδῆς” of the Homeric Hymn to Hermes and Pindar’s “ἐπέων οἶμον.”<sup>543</sup> In choosing their path, the Argonauts follow the path of the *Odyssey*, and Apollonius chooses own his poetic path to follow. This is enhanced by repeated references to Orpheus, a metapoetic figure within the poem, driving the ship on with his singing.<sup>544</sup> The Argo is, almost literally, propelled by poetry.

Orpheus’ most important moment arrives early in Book 1, when, during their feast before embarking, he interrupts a fight between Idmon and Idas with a song:

He sang how the earth and the sky and the sea, were previously fitted to each other in one shape, but then were divided from each other by destructive strife, and [he sang] how the constellations always and forever hold fast a sign in the sky, as well as the moon and the paths of the sun, and [he sang] how the mountains and the roaring rivers, with their nymphs, rose up, and how all the creeping reptiles came to be. He sang how first Ophion and Eurynome, the daughter of Ocean, held power on snowy Olympus, and [he sang] how by force and arms he yielded the honor to Cronos, and she to Rhea, and then they ruled over the blessed Titan gods, while Zeus, still a child, still seeming infantile in his thought, was living in the Dictaeon cave. Not yet had the earth-born Cyclopes strengthened him with the thunderbolt, and thunder, and lightning. For these things give glory to Zeus.

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<sup>543</sup> *h.Merc.*451; *Pin.O.*9.47. See also Albis (1996), pp. 100-105; 115-17.

<sup>544</sup> Such as at *A.R.*1.540-43. On Orpheus’ role in the *Argonautica*, see Klooster (2011), pp. 82-87.

ἦειδεν δ' ὡς γαῖα καὶ οὐρανὸς ἠδὲ θάλασσα,  
τὸ πρὶν ἐπ' ἀλλήλοισι μιῇ συναρηρότα μορφῇ,  
νεῖκος ἐξ ὀλοοῖο διέκριθεν ἀμφὶς ἕκαστα:  
ἠδ' ὡς ἔμπεδον αἰὲν ἐν αἰθέρι τέκμαρ ἔχουσιν  
ἄστρα σεληναίη τε καὶ ἡέλιιο κέλευθοι:  
οὐρεά θ' ὡς ἀνέτειλε, καὶ ὡς ποταμοὶ κελάδοντες  
αὐτῆσιν νύμφησι καὶ ἐρπετὰ πάντ' ἐγένοντο.  
ἦειδεν δ' ὡς πρῶτον Ὀφίων Εὐρυνόμη τε  
Ἔκεανὶς νιφόντος ἔχον κράτος Οὐλύμποιο:  
ὡς τε βίη καὶ χερσὶν ὁ μὲν Κρόνῳ εἴκαθε τιμῆς,  
ἠ δὲ Ῥέη, ἔπεσον δ' ἐνὶ κύμασιν Ἔκεανοῖο:  
οἱ δὲ τέως μακάρεσσι θεοῖς Τιτῆσιν ἄνασσον,  
ὄφρα Ζεὺς ἔτι κοῦρος, ἔτι φρεσὶ νήπια εἰδώς,  
Δικταῖον ναίεσκεν ὑπὸ σπέος: οἱ δέ μιν οὐπῶ  
γηγενέες Κύκλωπες ἐκαρτύναντο κεραυνῶ,  
βροντῆ τε στεροπῆ τε: τὰ γὰρ Διὶ κῦδος ὀπάζει. (A.R.496-511)

This passage, so early in the poem, voiced by Orpheus, is clearly an important programmatic statement for the *Argonautica* as a whole. Many have commented on its connection to the songs of Demodocus in the *Odyssey* Book 8, and how those allusions have been filtered through the lens of Homeric allegory and Empedoclean cosmogony.<sup>545</sup> The passage has also been connected to other important passages in the poem, especially the ekphrasis of Jason's cloak, which also contains Empedoclean references, and the scene in Book 3 of Eros, described much like Zeus in this passage, playing with a ball that is clearly a symbol for the world.<sup>546</sup> The Empedoclean pair of love and strife also plays an important thematic role in the narrative of the poem, where Jason's method of success usually involved more of the former than the latter.<sup>547</sup> These intertexts and

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<sup>545</sup> See especially Nelis (1992); Kyriakou (1994), but also Clauss (1993), pp. 83-85; Hunter (1993), p.12; Albis (1996), pp. 48-49; Pietsch (1999).

<sup>546</sup> Pendergraft (1991).

<sup>547</sup> On the significance of Jason's Lothario ways for his position as an epic hero, Nelis (1992), Clauss (1993), pp.37-87; Beye (1982), pp. 143-68.

intratexts show that Orpheus' song is about the universe as a whole, the poem as a whole, and the beginnings of both.

There is another intertext that needs to be brought into this discussion, and that is an Orphic hymn to Ocean: "I call upon Ocean, undying father, always existing, origin of both immortal gods and mortal humans, who surges around the boundary circle of the earth."<sup>548</sup> The song is marked at the halfway point by the repetition of "ἤειδεν," and scholars have noted how disparate the two halves of the Orpheus' song in the *Argonautica* are. Ocean, as a mythological figure, becomes a much more important figure in the second half.<sup>549</sup> But in fact, Ocean is the element that unites the two halves of the song. Although earth, heaven and sea (θάλασσα) separate at the beginning of the poem, Ocean is a distinct entity, both the origin of the pre-Titan gods and their ultimate end. This poem suggests that we should see Ocean as a more prominent figure in Orpheus' song. It is possible that, in the first half of the song, the reference to the stars is a mirror to the divine life cycle in the second half; like the gods, they rise up out of Ocean and set back into it.

In Callimachean poetry, Ocean is typically read as a metaphor for Homer.<sup>550</sup> This is likely important to an understanding the role of Ocean and Homer within this poem and within Orpheus' song. Homer is the source of all poetry, just as Ocean is the source

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<sup>548</sup> Orph.fr.83: "Ὠκεανὸν καλέω, πατέρ' ἄφθιτον, αἰὲν ἔόντα,/ ἀθανάτων τε θεῶν γένεσιν θνητῶν τ' ἀνθρώπων,/ ὃς περικυμαίνει γαίης περὶ τέρμονα κύκλον." See Romm (1992), p. 177. The poem is quoted in the Pl.*Crat.*402b5, so there is no concern about chronology. On the Orphic *Argonautica*, see also Albis (1996), p. 28, n.36; Mooney (1912), p.18

<sup>549</sup> Nelis (1992), pp.159-60.

<sup>550</sup> See Williams (1978), pp. 98-99. Romano (2011), p. 321, has suggested that in fact the contrast in this metaphor is of sound rather than size: Homer can roar, Callimachus seeks to trickle quietly.

of the universe, and Orpheus himself parallels Demodocus, who is considered a stand-in for Homer. This connection to Ocean in Orpheus' song strengthens the ties between the cosmological theme of the song and its metapoetic significance, linking both to Homer, who is also, incidentally, widely established as the 'ἀρχηγέτης' of geography.<sup>551</sup> The fact that the Argo never reaches Ocean suggests Apollonius therefore openly acknowledges his own departure from the unattainable Homeric model. Scholars have typically read the *Argonautica* as epic for the Hellenistic Period: pared down, simpler, more concise.<sup>552</sup> Apollonius and the Argo do not completely surround the earth, as Homer and the Ocean do, but rather they travel a smaller circle.

In our understanding of Apollonius' relationship with Homer, the poetic and geographical cannot be separated. Homer is the preeminent poet, but he is also an important figure in the development of geography as a discipline. Apollonius' *Argonautica* represents a poem that embraces both of those aspects of the archaic poet. His poem argues against the type of geographical writing that Eratosthenes advocates, excluding Homer. Instead, he offers a demonstration of how epic poetry can serve as a geographical treatise, while also still operating in a literary tradition, using signs to prove his own veracity and to tie perplectic and Homeric geography together. Apollonius seeks to re-establish the authority of poetry on scientific subjects, and in the following chapter, Nicander will capitalize on that ability to authorize a new subject, and, in the process, situate himself in the canon of scientific poets.

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<sup>551</sup> Str.1.1.2, where he cites Hipparchus in support.

<sup>552</sup> See DeForest (1994), especially pp. 18-36

## CHAPTER 3: NICANDER'S AMBIGUOUS POETIC LEGACY

### I. Introduction: Scientific poetry vs. Didactic poetry

Nicander, probably writing in the late second century BCE, looks back on the developments that occurred in poetry in the previous century from a position of belatedness.<sup>553</sup> It is therefore not surprising that he represents a shift in the composition of scientific poetry. His use of intertextual allusions shows that he is very knowledgeable about all the of the major poets of the time period, but patterns of influence emerge in his work that show a higher level of Aratean and Callimachean allusions than Apollonian ones.<sup>554</sup> This is somewhat surprising, for, in many ways, Apollonius would make a logical source of inspiration for Nicander. First of all, the *Argonautica* has several

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<sup>553</sup> Nicander's dating has been a subject of dispute for a long time. The scholia and *vitae* offer such conflicting information that, depending on what evidence one accepts, three possibilities arise: Nicander may have composed in the in the early 3<sup>rd</sup> cent. BCE, contemporary with Callimachus and Aratus, or in the reign of Ptolemy V (reg. 204-181), or of Attalus III (reg.138-33). Adding further complication is an inscription from Delphi dedicated by a "Nicander, epic poet of Colophon," (SIG<sup>3</sup> 452 = test. D in Gow-Schofield (1953)), dated by most scholars to the mid-third century. A more complete picture of the problems with the evidence can be found in Magnelli (2006a), pp.185-87; Massimilla (2000), p.129, n.11; Gow and Schofield (1953), pp. 3-8, which also provides all of the relevant textual evidence. Pasquali (1913) first introduced the idea of two Nicanders, possibly a grandfather and grandson, as way of reconciling some of the conflicting alternatives, including the information about the name of Nicander's father. Pasquali assigned the two extant poems and most of the fragments to the younger Nicander, who he believed lived during the reign of Attalus III, and attributed to the elder Nicander, living in the mid-third century, the lost *Ophiaka*, *Europa*, and *Aitolika*. Cameron (1995), pp. 194-207, argues that the poet of the *Theriaca* and the *Alexipharmaca* is the elder Nicander, living in the early third century, and that the younger poet probably lived around the year 200 BCE. Gow and Schofield (1953) assign both extant poems and all surviving fragments to the younger Nicander, whom they date to the reign of Attalus III in the late second century. This position has been widely accepted, see Overduin (2014a), pp.9-12 and Magnelli (2006a), who also uses intertextual references within the poetry to demonstrate the likelihood that is Nicander is quite belated in the Hellenistic Period. For the purposes of this dissertation, it is clear that the same author composed both the *Theriaca* and the *Alexipharmaca*, and that this author lived late enough to be familiar with the works of Aratus, Callimachus, Apollonius, and Theocritus, but not vice versa. A late 2nd century date, connecting him to Attalus III who was known to have an interest in toxicology, seems most plausible, and may explain the reference in the proem of the *Alexipharmaca* to the sacred rites of Attes (*Alex.8*).

<sup>554</sup> Magnelli (2006a), pp. 189-196, offers some concrete examples of Nicander's use of Apollonius in his poetry, but Overduin (2014a), p. 71, sees less influence of Apollonius than other poets, such as Callimachus and Antimachus of Colophon.

extended passages on medical subjects, including Mopsus' death from a snakebite.<sup>555</sup> Secondly, Nicander's use of prose sources mirrors that of Apollonius, in several respects. Neither poet depends so much on one source in the way Aratus does, but instead they collect information from a wide variety of texts and incorporate them into a cohesive whole.<sup>556</sup> But the texts do not support a reading of Nicander that is heavily dependent on Apollonius. In this chapter, I will argue that Nicander's relationship with Aratus and other Hellenistic poets informs both the poetic and scientific aims of his poetry and these goals cannot be separated from one another. In many ways, Nicander's oeuvre offers the perfect representation of scientific poetry as a cohesive concept.

Is there any Greek poet more loathed, even by those who study him, than Nicander? It is true that Nicander was apparently highly valued in Rome, and that even Quintilian, who spares no compliments for Aratus, seems somewhat favorably disposed towards Nicander.<sup>557</sup> But modern critiques often unite scorn for his lack of expertise in toxicology and for his inability to write about it. Gow and Schofield, whose revision of the *editio princeps* of both poems was intended to offer wider access to his corpus, describe his poetry as "the combination of a repulsive style with considerable metrical accomplishment."<sup>558</sup> This assessment is mostly modern, however, and Scarborough

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<sup>555</sup> A.R.1502-31. See Wick (2009).

<sup>556</sup> Scholars sometimes claim that Nicander is using the toxicological treatise of a figure named Apollodorus to a slavish degree, see especially Scarborough (1977); (1979). Apollodorus is occasionally cited by scholiasts as the origin of a particular piece of information in Nicander's poetry, but no tradition exists like that for Aratus and Eudoxus that ties them together so closely. See Jacques (2002), pp. xx-xlix, for a thorough discussion of the sources Nicander uses in his poetry. It should be noted that personal observation need not be excluded from this list, as Jacques suggests (admittedly with no evidence) that Nicander may have had his own garden of medicinal plants. The tradition that Apollodorus is Nicander's Eudoxus can be traced back to Wellmann (1898), a work focused on *Quellenforschung*.

<sup>557</sup> Quint.10.1.56, see Overduin (2014a), pp.127-37, on Quintilian's reading of Nicander.

<sup>558</sup> Gow and Schofield (1953), p. 8; quoted in Magnelli (2010), p. 211, Cameron (1995), p. 205.

claims he shows “no competence in the subjects or specifics of poisons and toxicology,” in poems that are “artificial, strained, obtuse, and intentionally obscure.”<sup>559</sup> Nicander, in the scholarly consensus, is good neither at poetry nor at medicine.<sup>560</sup>

Rarely is Aratus so praised as when he is compared to Nicander. Gow and Schofield, again, in a frequently quoted line, make the contrast severe: “The difference between the two poets is that whereas the uninstructed reader may learn a good deal of astronomy from Aratus, the victim of a snake-bite or poison who turned to Nicander for first-aid would be in a sorry plight.”<sup>561</sup> The criticisms of Nicander, as in this quotation, often focus on his perceived failures as a didactic poet in the most literal sense.<sup>562</sup>

Whereas Aratus’ educational goals seem sincere, Nicander either has no serious interest in teaching his material to the novice, or he fundamentally misunderstands how to do so. Overduin has argued very forcefully that, “the *Theriaca* is first and foremost intended as a literary showpiece,” and he discounts any serious didactic purpose to the work.<sup>563</sup>

Overduin treats Nicander’s work seriously, but his claims are still built on older interpretations of the poetry, which claim that because Nicander is not a good teacher, the subject matter of Nicander’s poetry is largely meaningless.<sup>564</sup> Nicander is primarily interested in his own legacy, as I will show, but this not preclude a serious interest in the material he presents. The fact that he did not produce an easily understandable, practical

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<sup>559</sup> Scarborough (1977), p. 4.

<sup>560</sup> See Cameron (1995), p. 195.

<sup>561</sup> Gow and Schofield (1953), p. 18.

<sup>562</sup> See Effe (1977), pp. 64-65, and Toohey (1996), p. 66, where he describes the pedagogical conceit of the poem as a “ploy.”

<sup>563</sup> Overduin (2014a), p. 138, see also p. 253 for an example of his reading of Nicander’s didacticism.

<sup>564</sup> See especially Effe (1977), 56-65, and Toohey (1996), 61-73, for this point of view, but it is also expressed in Fantuzzi (2006) and many others.



text like the *Phaenomena* springs from his greater interest in ambiguity and uncertainty, two concepts in which Aratus shows little interest. These are important themes for Nicander, not accidental results of his incompetence. That is, the difficulty of Nicander's poetry is a feature, not a bug.

There is surprisingly little discussion of the differences between the two extant poems of Nicander, the *Theriaca* and the *Alexipharmaca*.<sup>565</sup> Although subject and style leave little doubt that they are products of the same poet, there are differences between the two works, especially in structure, which will be discussed in section 3 of this chapter. The relative chronology of the two poems is impossible to determine, and scholars often use passages from one poem to explicate interpretations of the other, with little consideration of the possible chronological implications.<sup>566</sup> The *Theriaca* has a slightly higher reputation for literary quality, as evidenced by the commentary recently published by Overduin.<sup>567</sup> This is likely because of its centerpiece, an elaborate catalog of snakes that manages to incorporate allusions to a large number of earlier poetic serpent appearances.<sup>568</sup> Moreover, the greater number of mythological stories and explicit references to Hesiod and Aratus make it easier to discuss in the context of the tradition of didactic poetry.<sup>569</sup> In this chapter, I have presented Nicander's poetry as a cohesive unit, but I have focused on the *Theriaca*, because it provides more evidence of Nicander's engagement with his poetic predecessors.

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<sup>565</sup> The exception being Jacques (2007), p.xiii.

<sup>566</sup> See for example, Clauss (2006), p.164. Without making any explicit statement on chronology, Sullivan (2013) implies the reverse order of composition, suggesting that the *Alexipharmaca* acrostic is an 'antidote' to that in the *Theriaca*.

<sup>567</sup> Overduin (2014a).

<sup>568</sup> Magnelli (2006a), p. 189; See also Overduin (2010), p. 274.

<sup>569</sup> See Overduin (2014a), p.3

It is unlikely that Nicander intended his poetry, especially the *Theriaca*, to be informative or useful to a snakebite victim in sudden need. And, unlike for Aratus, we have little evidence suggesting that his work was used as a teaching text.<sup>570</sup> But here it is important to make a distinction between didactic poetry and scientific poetry, a distinction that Overduin elides when he suggests that Nicander's level of expertise in toxicology is irrelevant to the poem. The fact that Nicander does not aim to teach a wider audience, or, to use Gow and Schofield's term, "an un instructed reader," does not preclude him from advancing serious ideas on the subject of toxicology within his poetry. Nicander's poetry is cited most frequently by medical and scientific writers such as Galen and Pliny the Elder, suggesting that his works were widely read in the specialized world of scholarly research.<sup>571</sup> There can be no dispute that Nicander's work is aimed at an exceptionally learned audience, but that learning includes both poetic and medical texts.

The assumption that Nicander was interested in teaching comes from his choice to compose in the difficult-to-define genre of didactic poetry.<sup>572</sup> Nicander's obvious inspiration in the models of Hesiod and Aratus does suggest that his poetry is intended as a teaching tool, but Nicander is not merely replicating his models.<sup>573</sup> He also takes pains to distinguish himself from them as well, and the pedagogic purpose of the *Phaenomena*

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<sup>570</sup> Overduin (2014a), p.139.

<sup>571</sup> See Overduin (2014a), pp. 132-35, where he states that, p.132, "In this field [i.e., medical and biological writing] Nicander's fame appears to have made the most enduring impact."

<sup>572</sup> Effe (1977) is the first major systematic approach to defining the genre. See also Toohey (1996); Dalzell (1996); Volk (2002). Overduin (2014a), pp. 12-31, situates Nicander's work in the criteria used by Volk (2002), pp. 6-24, to define didactic poetry, but this is problematic because Volk, aside from any question about the validity of her criteria, it is defined from texts written at least a century after Nicander, in a different culture.

<sup>573</sup> On the possibility that Hesiod intended the *Works and Days* as a depiction of farm life rather than an instructional manual, see Nelson (1996).

is likely one of the things he changes in his work. In fact, throughout the *Theriaca*, signs become a way for Nicander to connect to *and* depart from Aratus' *Phaenomena*. In this chapter, I will explore the scientific-poetic goals of Nicander's poetry. The chapter will focus on four issues: 1) Nicander's relationship to his predecessors, especially Aratus; 2) the organization of material and the role of catalogs; 3) linguistic ambiguity and species identification; and 4) his depiction of nature and the value of scientific knowledge. In each of these sections, I will argue that Nicander's poetry displays an interest in ambiguity and his own legacy.

## II. Nicander in the Aratean Tradition

In antiquity, Nicander was frequently grouped together with Aratus, usually in discussions of their ignorance of their subject matter. Cicero uses both poets as examples of the fact that one needn't understand a subject to write elegantly about it.<sup>574</sup> Similarly, one the *vitae* of Aratus tells the story that Aratus was a doctor and Nicander an astronomer, and that Antigonus Gonatas compelled them to switch subject matter for their compositions.<sup>575</sup> In this section, I will discuss Nicander's role in making this connection between the two poets, the problems this connection creates, and how it affects our understanding of the content Nicander chose for his poem, which is not meaningless.

Cameron argues that the two poets were contemporaries and sees little influence of Aratus on Nicander, but his chronology is not widely accepted, and most scholars see

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<sup>574</sup> Cic. *de Orat.* 1.16.

<sup>575</sup> Cameron (1995), p. 195, thinks Cicero is referring to the story recounted in the *Lives*.

Nicander as following in Aratus' tradition.<sup>576</sup> It may be possible to overstate the amount of influence Aratus had on Nicander's poetry, even if Cameron veers in the other direction, reducing the similarities to "a handful of rather dubious echoes."<sup>577</sup> There are lexical borrowings from the *Phaenomena* throughout both the *Theriaca* and the *Alexipharmaca*, but there are also borrowings from other major Hellenistic poets, especially Callimachus and Theocritus, and most of the language is the same scholarly Homeric diction that was associated with the Alexandrians.<sup>578</sup> The organization of the poem, with its marked language in the introduction of each new entry in the catalog, is modeled on the *Phaenomena*, but the overall structure of the poems is quite different. Aratus' poem can be divided into either two or three sections, whereas Nicander creates four separate catalogs, alternating between dangerous animals (first snakes, then other venomous creatures) and remedies for their venoms.<sup>579</sup>

Nicander's most direct borrowing from Aratus, the two acrostics of his name, are also his most famous.<sup>580</sup> Because of the textual issues with the acrostic in the *Alexipharmaca*, I will focus on the passage in the *Theriaca*, but recently Sullivan has

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<sup>576</sup> Cameron (1995), pp. 202-05. See fn. 553 for Cameron's position on Nicander's chronology, which is likely the reason Cameron discounts Nicander's use of Aratean intertexts. See Clauss (2006) and Sullivan (2013) for examples of scholarship where the relationship between the two is considered obvious but not explored. Magnelli (2010), pp. 220-23, does discuss the relationship in slightly greater detail.

<sup>577</sup> Cameron (1995), p. 204.

<sup>578</sup> Aratus' language is also quite similar, however, see Kidd (1997), pp. 23-26.

<sup>579</sup> Gutzwiller (2007), pp.99-100, argues for a tripartite division of the *Phaenomena*; Overduin (2014a), p.50, rejects this, claiming a bipartite structure is one of the similarities between Nicander's and Aratus' poetry.

<sup>580</sup> The acrostics were first found (in modern times) by Lobel (1928), p. 14, ironically, several decades before Jacques (1960) discovered Aratus' acrostic. In antiquity, Reeve (1996-97), pp. 247-50, argues convincingly that it was known to Dionysius Periegetes, at least. The acrostic in the *Theriaca* (*Ther.*345-53) is without dispute, but that in the *Alexipharmaca* (*Alex.*266-74) is defective, if one does not accept the textual emendations proposed by Jacques (2007). See Sullivan (2013), p. 239, n.34; Courtney (1990), pp.12-13.

argued compellingly that these two passages should be read together and that the *Alexipharmaca* acrostic passage represents an “antidote” to the *Theriaca*.<sup>581</sup> The *Theriaca* acrostic is within a description of the Dipsas snake, and demonstrates that Nicander’s interest in the *Phaenomena* is greater than mere lexical borrowing. Whereas Aratus’ acrostic illustrated an important tenet of his poem, Nicander inserts his own name into the poems, another suggestion that his interest in the educational value of his work was limited at best. The *Theriaca* passage is overtly programmatic, telling the story of Zeus’ gift of youth to humans, which is stolen by a snake when the ass carrying it runs off with a desperate thirst:

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<sup>581</sup> Sullivan (2013), pp. 237-43.

An old story is spread by those living today, that, when the eldest blood of Cronos held the heavens, dispensing to his brothers renowned dominions from afar, he in his wisdom gave the day-living ones the prize of youth, honoring them, for they had told him of the Fire Bandit. Thoughtless ones, they got no use from their folly. For tiring and being sluggish, they put the gift on a bare-backed beast, but leaping up, he rushed off, his throat burning with thirst, and seeing a slithering, noxious creature by its lair, he beseeched it to relieve his evil plight, fawning at it. Then it asked the thoughtless beast for the gift which he had taken upon his back, and he did not reject the obligation. And ever since, slithering creepers slough their elderly skin, but wretched old age accompanies mortals. And the baleful monster took parching thirst from the brayer, and with faint blows he sends it forth.

ὠγύγιος δ' ἄρα μῦθος ἐν αἰζηοῖσι φορεῖται,  
ὥς, ὅπότε' οὐρανὸν ἔσχε Κρόνου πρεσβίστατον αἶμα,  
Νειμάμενος κασίεσσιν ἐκάς περικυδέας ἀρχάς  
Ἰδμοσύνη νεότητα γέρας πόρεν ἡμερίοισι  
Κυδαίνων· δὴ γάρ ῥα πυρὸς ληίστορ' ἔνιπτον.  
Ἀφρονες, οὐ μὲν τῆς γε κακοφραδῆς ἀπόνηντο·  
Νωθεῖς γὰρ κάμνοντες ἀμορβεύοντο λεπάργω  
Δῶρα· πολὺσκαρθμος δὲ κεκαυμένος ἀνχένα δίψη  
Ρῶετο, γωλειοῖσι δ' ἰδὼν ὀλκήρεα θῆρα  
Οὐλοὸν ἐλλιτάνευε κακῆ ἐπαλαλκόμεν ἄτη  
Σαίνων· αὐτὰρ ὁ βρῖθος ὃ δὴ ῥ' ἀνεδέξατο νότοις  
ἦτεεν ἄφρονα δῶρον· ὃ δ' οὐκ ἀπανήνατο χρεῖω. ἐξότε  
γηραλέον μὲν αἰεὶ φλόον ἐρπετὰ βάλλει  
ὀλκήρη, θνητοὺς δὲ κακὸν περὶ γῆρας ὀπάζει·  
νοῦσον δ' ἄζαλέην βρωμήτορος οὐλομένη θήρ  
δέξατο, καί τε τυπῆσιν ἀμυδροτέρησιν ἰάπτει. (*Ther.*343-358)

The phrasing is crabbed and elliptical, even for Nicander, and the passage contains many echoes of Hesiod, such as references to Prometheus and prelapsarian time, as well as the use of multiple kennings and the pessimistic picture of modern life.<sup>582</sup> On top of these Hesiodic elements is the combined imitation of Aratus' two most famous poetic flourishes, his acrostic and the hidden pun on his name in the proem of the *Phaenomena*.<sup>583</sup> The passage also imitates Aratus' programmatic Dike catasterism as

<sup>582</sup> Overduin (2014a), pp. 309-10.

<sup>583</sup> *Phaen.*2 : “ἄρρητον.” On this line, see Bing (1990); (1993).

well, by echoing the three ages of men in the development of the story. At first humans are beloved by the gods and converse with them freely, as they do with Dike in Aratus' Golden Age. Then the story changes focus to the foolishness and the impudence of the men, similar to that of the Silver Age men whom Dike rebukes for their "κακότης."<sup>584</sup> But Nicander's resolution, the depressing mortality of modern humans, reverses Aratus' conclusion with constellation in the sky, replacing the hopeful message of the *Phaenomena* passage with a much more Hesiodic, gloomy conclusion.<sup>585</sup>

Nicander hides the names of characters and animals throughout by using kennings: Zeus is the "eldest blood of Cronos" (Κρόνου πρεσβίστατον αἷμα), Prometheus is the "Fire Bandit" (πυρὸς ληίστορ), and neither the ass, the snake, nor humans are ever mentioned by name.<sup>586</sup> Scholars have noted the metapoetic aspects of this passage, focusing in particular on the way Nicander assures poetic immortality for himself by writing his name into his work, while describing the mortality of humans.<sup>587</sup> The literary intentions of this passage go even further, however, as Nicander constructs a lineage for himself from Hesiod through Aratus.

A third poet also figures in Nicander's metaliterary commentary in this passage: Callimachus. Nicander alludes several times within the story to an Aesopic fable in Callimachus' *Iamb 2*, "The Fox, the Swan, and Zeus," a story in which Zeus decides to

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<sup>584</sup> *Phaen.* 121.

<sup>585</sup> Clauss (2006), p. 164, argues that Nicander embraces a much more optimistic worldview than Hesiod, and this may be true in many instances throughout the poem, but the story of how mankind lost the opportunity to be eternally youthful is still rather post-lapsarian.

<sup>586</sup> Overduin (2014a), p. 314; see also Van Dijk (1997), pp. 134-37.

<sup>587</sup> Overduin (2014a), p. 314; Clauss (2006), p. 171; Sullivan (2013), p. 235. See also Klooster (2011), pp. 175-208, on the sphragis in Hellenistic poetry more generally, but without reference to Nicander.

give the power of speech to humans instead of animals, because of criticism from the fox.<sup>588</sup> The story not only has thematic resonances with this fable, but also weaves Nicander's name even deeper into the fabric of the passage: Callimachus' addressee in the poem is named Andronikos.<sup>589</sup>

Callimachus is crucial to understanding Nicander's relationship to Hesiod and to Aratus in this passage. As discussed previously, various writers debated whether Aratus was an emulator of Homer or Hesiod, and it is likely that the epigrams of Callimachus and Leonidas comment on this debate.<sup>590</sup> This passage makes an argument for the Hesiodic camp, strengthened by the allusions to its most distinguished proponent, Callimachus. The description of the appearance of the Dipsas snake and the symptomatology of its bite supports a metapoetic valence to this passage:

Indeed the form of the dipsas will always resemble a small viper, but a faster death will come to those it attacks with its terrible bite. Its little tail, always dark, grows blacker at the tip. The [victim's] heart is enflamed all over by its bite, and unmoistened lips are seared by a scorching thirst. Then he, like a bull leaning over a river, greedily gulps down immeasurable drink, until his belly bursts at the navel and pours out its overburdening load.

Ναὶ μὴν διψάδος εἶδος ὁμώσεται αἰὲν ἐχίδνη  
παυροτέρη, θανάτου δὲ θοώτερος ἴζεται αἴσα  
οἴσιν ἐνισκίμψη βλοσυρὸν δάκος· ἦτοι ἀραιή  
αἰὲν ὑποζοφόεσσα μελαίνεται ἄκροθεν οὐρή·  
δάχματι δ' ἐμφλέγεται κραδίη πρόπαν, ἀμφὶ δὲ καύσῳ  
χείλε' ὑπ' ἀζαλέης ἀναίνεται ἄβροχα δίψης·  
αὐτὰρ ὄγ', ἠύτε ταῦρος ὑπὲρ ποταμοῖο νενευκῶς,  
χανδὸν ἀμέτρητον δέχεται ποτὸν εἰσόκε νηδύς  
ὀμφαλὸν ἐκρήξειε χέη δ' ὑπεραχθεά φόρτον. (*Ther.*334-42)

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<sup>588</sup> Call. fr.192 Pfeiffer. The fragment contains only the rough sketches of this story, and the rest is supplied by *Dieg.*6.22-29 ad Call.fr.192.1 Pfeiffer. See also Sullivan (2013), pp. 231-33.

<sup>589</sup> Sullivan (2013), pp. 236-37.

<sup>590</sup> See pp. 45-52 and fn. 161.



This section is linked to the subsequent fable by the emphasis on thirst, the etymological explanation of the name of the snake, and the echo of the victim, desperate with thirst, spilling his “φόρτος,” and the donkey relinquishing his own burden for the same reason.<sup>591</sup> The comparison of the victim to the bull, told with characteristic Nicandrian horror, provides a commentary on the poetic lineage Nicander has constructed. The bull drinks “χανδόν,” “greedily,” a Homeric hapax that was used by Callimachus and Lycophron. Callimachus uses the term in a clearly metapoetic passage of the *Aetia*. The narrator describes his drinking companion at a festival:<sup>592</sup>

He was born in Ikios, the man with whom I shared a couch—but the Homeric story (αἴνος) doesn’t lie that the god always draws like to like. For he also abhorred to drink wine in a Thracian greedy gulp, but instead preferred a small cup.

ἦν δὲ γενέθλην  
 Ἴκιος, ᾧ ξυνὴν εἶχον ἐγὼ κλισίην  
 οὐκ ἐπιτάξ, ἀλλ’ αἴνος Ὀμηρικός, αἰὲν ὁμοῖον  
 ὡς θεός, οὐ ψευδής, ἐς τὸν ὁμοῖον ἄγει.  
 καὶ γὰρ ὁ Θρηϊκίην μὲν ἀπέστυγε χανδὸν ἄμυστιν  
 οἶνοποτεῖν, ὀλίγῳ δ’ ἦδετο κισσυβίῳ. (Call. *Aet.* f. 178.7-12 Pfeiffer)

Nicander’s use of the word to describe a bull drinking from a river echoes Callimachus’ aesthetic metaphor in this passage, contrasting the bull and snakebite victim drinking too much from the river and the terrible death that comes to him with the small, agile snake,

<sup>591</sup> There is also a similar figura etymologica with the gift (γέρας, Th. 346) the humans entrust to the donkey, and the old age (γῆρας, Th. 356) they ultimately end up with. See Overduin (2014a), pp. 74-76; Sullivan (2013), p. 233.

<sup>592</sup> Overduin (2014a), p. 309, sees Lyc. 1425 as the relevant allusion for Nicander: “χανδὸν κελαινῆν διψαν αἰονωμένων” (“as they quench with open mouth their black thirst,” trans. Overduin), and certainly the reference is operative within the passage. My focus on the role of the Callimachean reference (which is likely in Lycophron’s mind as well, considering that both reference Thrace) does not preclude this, but Overduin disputes any Callimachean, metapoetic meaning to this passage, without explaining why. See also Gow-Schofield (1953), p. 171, on the scholion suggesting the animals come from Typhon, not a Titan but a similar type of deity.

described as “ἀραιός” and “παυρότερος.”<sup>593</sup> This is compounded by the other Callimachean allusion discussed above, which also has a metapoetic valence.<sup>594</sup> The delicate Dipsas snake lives forever, as does Nicander, thanks to his acrostic, whereas the man who drinks too much from the river dies unnamed in a particularly horrible fashion. Nicander is therefore aligning himself (and Aratus) with the Hesiodic poetic tradition, as defined by Callimachean aesthetics. Given the metapoetic features of this passage, it is likely that Nicander, like Callimachus, saw Aratus’ use of λέπτῃ for his acrostic as a reference to Callimachean aesthetics, and this passage signals Nicander’s own commitment to the aesthetic style he sees in his predecessors. The combination of Hesiodic, Aratean, and Callimachean allusions in this passage makes it one of the most complex in Nicander’s oeuvre and demonstrates his awareness of his place in the poetic tradition. Aratus’ *Phaenomena* is the nexus of the intersecting allusions that Nicander uses to define his own poetry.

Nicander is not, however, ‘the toxicological Aratus.’ In fact, the proem of the *Theriaca* makes important contrasts between the two poets. Like the Dipsas snake passage, the proem includes a dense set of allusions to Hesiod and Aratus, such as beginning with the term “ῥεῖα,” which is used in the proem of the *Works and Day* four times, three at the beginning of the line.<sup>595</sup> He also ends the proem with the word “ἔσθήρικται,” the verb Aratus uses in his proem, also at the end of the line, in the same

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<sup>593</sup> *Ther.* 336; 335. ἀραιός is only used once in the extant Callimachean corpus, *Del.* 191, where any metapoetic significance is slight.

<sup>594</sup> Sullivan (2013), p. 233

<sup>595</sup> *Hes.Th.* 5;5;6;7, although it is spelled “ῥέα” in the first two instances. On Nicander’s use of it as a key word for Hesiod, Overduin (2014a), pp. 47-49; Clauss (2006), pp. 160-64.

context.<sup>596</sup> The proem, however, diverges sharply from the aretologies in both the *Works and Days* and the *Phaenomena*, and, in fact, omits any kind of prayer language or invocation of a deity:<sup>597</sup>

Easily (ῥεῖα) the forms and grievous injuries of animals, striking unforseen (ἄπροϊδῆ), and the counteracting cures for the illness, dear Hermesianax, most gloried of my many relatives, I will tell you, without fail. And the hardworking ploughman, and the cowherd and the woodcutter whenever in the woods, or while ploughing, something might cast its baneful tooth upon him, will respect you, being knowledgeable about such remedies for illness.

But truly, evil-doing spiders, and with them troublesome reptiles and vipers and the countless burdens of the earth, they say these are from the blood of Titans, if truly the Ascræan at the steeps of the remote Melisseeis, Hesiod, recounted, beside the waters of the Permessus. The Titanian daughter sent up the chilling scorpion, with its stinger whetted, when she attacked, fashioning an evil fate for the Boiotian Orion, after he grasped at her undefiled peplos. But this one struck him at the ankle of his mighty foot, the unseen (ἄπροϊδής) scorpion, lying in wait under a little stone. And his illustrious sign (τέρας περίσημον), there under the unwandering stars, as if he were hunting, is set firm, dazzlingly bright (ἀειδελον).

Ῥεῖά κέ τοι μορφάς τε σίνη τ' ὀλοφώια θηρῶν  
 ἀπροϊδῆ τύψαντα λύσιν θ' ἕτεραλκέα κήδευσ,  
 φίλ' Ἑρμησιάναξ, πολέων κυδίστατε παῶν,  
 ἔμπεδα φωνήσαιμι· σὲ δ' ἄν πολύεργος ἀροτρεύς  
 βουκαῖός τ' ἀλέγοι καὶ ὀροϊτύπος, εὔτε καθ' ὕλην  
 ἢ καὶ ἀροτρεύοντι βάλῃ ἐπι λοιγὸν ὀδόντα,  
 τοῖα περιφρασθέντος ἀλεξητήρια νούσων.

Ἄλλ' ἦτοι κακοεργὰ φαλάγγια, σὺν καὶ ἀνιγρούς  
 ἐρπηστὰς ἔχιάς τε καὶ ἄχθεα μυρία γαίης  
 Τιτήνων ἐνέπουσιν ἀφ' αἵματος, εἰ ἕτερόν περ  
 Ἀσκραῖος μυχάτοιο Μελισσήεντος ἐπ' ὄχθαις  
 Ἡσίοδος κατέλεξε παρ' ὕδασι Περμησσοῖο.  
 τὸν δὲ χαλαζήεντα κόρη Τιτηνὶς ἀνῆκε  
 σκορπίον, ἐκ κέντροιο τεθηγμένον, ἦμος ἐπέχρα  
 Βοιωτῶ τεύχουσα κακὸν μόρον Ὠαρίωνι,  
 ἀχράντων ὅτε χερσὶ θεῆς ἐδράξατο πέπλων·  
 αὐτὰρ ὄγε στιβαροῖο κατὰ σφυρὸν ἤλασεν ἴχνευς  
 σκορπίος ἀπροϊδῆς ὀλίγω ὑπὸ λαῖι λοχήσας·

<sup>596</sup> *Ther.*20; *Phaen.*10, where Aratus has the active “ἐστήριξεν,” as syntax demands, but he also uses it in the passive, at the end of the line, in *Phaen.*230; 274; 351; 500, see Overduin (2014a), p. 192; Effe (1974b), p. 120

<sup>597</sup> See Clauss (2006), pp. 162-69.

τοῦ δὲ τέρας περίσημον ὑπ' ἀστέρας ἀπλανῆς αὐτως  
οἷα κυνηλατέοντος ἀεΐδελον ἐστήρικται. (*Ther.*1-20)

James Clauss has suggested that Nicander's use of ῥεῖα as the first word of the poem is also a pun on the Titan goddess Rhea, which connects the rather prosaic opening with the mythological aitiology that follows.<sup>598</sup> Aratus' own Hesiodic reference in the proem of the *Phaenomena*, his use of the word “ἄρρητον,” (which Hesiod uses at *Op.*4), is the aforementioned pun on his own name. By hiding the name of a goddess in his poem, Nicander both separates himself from his literary inheritance, and also lays claim to it.

Nicander makes the greatest distinctions between himself and Aratus in the second half of the proem, the mythological aitiology. There are technically two separate aitiologies in this passage, one of the creation of the venomous animals and one of the catasterism of Orion, but the transition is marked only with a “δέ.”<sup>599</sup> Overduin attributes this to an artificially “associative” style of Nicander's poetry, intended to imitate oral composition, as if the poet only remembered the second story when he reached the end of the first.<sup>600</sup> This may be the case, but the lack of division also has the effect of melding the two stories into one, creating an implicit link between the poets alluded to in each. This is strengthened by the rather vague “Τιτηνίς” to describe Artemis: a name that links her with the previous story more than it elucidates her identity.<sup>601</sup>

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<sup>598</sup> Clauss (2006), p. 164, supports his argument with an explicit reference to Rhea in the proem of the *Alexipharmaca*, which does not have the same density of references to either Hesiod or Aratus.

<sup>599</sup> *Ther.* 13

<sup>600</sup> Overduin (2014a), p.186.

<sup>601</sup> *Ther.* 13. Overduin (2014a), pp.186-87, on the name. Apollonius (4.54) uses it to refer to the moon, which makes the connection to Artemis more secure. *Call.Del.*17 and *Lyc.*231 both use it as an epithet of Tethys.

The first story explicitly names Hesiod, whereas the second is adapted from Aratus.<sup>602</sup> The myth of Orion's catasterism is one of the mythological stories of the *Phaenomena*, although Aratus does not specify what provoked Artemis to send the scorpion after Orion.<sup>603</sup> The aitiologies distinguish Nicander from his predecessors, however, in a way that shows a particular sensitivity about the subject he has chosen for his poem. He stresses Orion's literal elevation, describing the constellation as ὑπ'ἀστέρας ἀπλανές, whereas he repeatedly associates the scorpion and other venomous animals with the earth.<sup>604</sup> They are the ἄχθεα μυρία γαίης, springing from the blood of the chthonic Titans, and the scorpion evades Orion's notice by hiding ὀλίγω ὑπὸ λᾶϊ.<sup>605</sup> The story establishes a contrast between the lofty constellations and the lowly snakes and other creatures of Nicander's story, a topic Clauss describes as "creepy, literally and figuratively."<sup>606</sup> There is also an interesting metapoetic contrast developed between the στιβαρὸς ἵχνος and the ὀλίγος λᾶας covering the Scorpion.<sup>607</sup> Nicander seems to comment directly on the inappropriateness of his poem as the emulation of the *Phaenomena*.

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<sup>602</sup> See Overduin (2014a), pp. 180-92 for all of the word correspondences, which are multiple, and Effe (1974b), p. 120.

<sup>603</sup> *Phaen.* 637-46. See Overduin (2014a), pp. 187-88; Kidd (1997), pp. 396-97, claims that Aratus' version is the earliest extant account of this story, but Overduin cites a fragment of the 4<sup>th</sup> century mythographer Palaephatus (Palaeph. 51 MG) that tells the same story. The fragment is difficult to attribute so certainly, however, as it comes from a Homeric scholion (Σ D ad Il. 18.486), and connects the story to the poet Euphorion, whose dates are too late to have been known to Palaephatus. The evidence is therefore too uncertain to determine precisely whether Aratus was the earliest inventor of this particular story, but the final two lines of Nicander's version, which include 3 particularly Aratean words (περίσημον, 19; ἀειδελον, ἐστήρικται, 20) make the reference perfectly clear.

<sup>604</sup> *Ther.* 19.

<sup>605</sup> *Ther.* 9; 18. See Clauss (2006), 166

<sup>606</sup> Clauss (2006), p. 162

<sup>607</sup> *Ther.* 17-18.

The other important contrast developed in this story is between the visible and the invisible. Nicander already signaled the importance of this idea in the opening of the proem, where he describes the animals attacking “ἄπροϊδῆ,” putting the word in the exact position and line (the first word of the second line) where Aratus used “ἄρρητον,” possibly as a signature.<sup>608</sup> Nicander’s “unforeseen” foreshadows his hidden signature later in the poem and its Aratean antecedents, but it also calls attention to the biggest discrepancy between his own work and the *Phaenomena*: the relative visibility of its subject matter. This is emphasized by the repetition of the term in line 18, which describes the scorpion’s surprise attack on Orion. Orion is a “τέρας περίσημον,” whereas the scorpion lives under a rock.<sup>609</sup> Aratus’ subject is easy to see, bright, and, quite literally, elevated. Nicander’s own interests are much cagier beasts, secretive and slightly sinister.

This contrast is summed up in the last word of the proem, where Orion’s constellation is described as ἀείδελος, which Gow and Schofield translate as “dazzling to behold.”<sup>610</sup> The word is an alpha-privative of a word formed from “εἶδω,” meaning “impossible to look at,” and Nicander is surely thinking of the Hesiodic usage of the word, which occurs in the same sedes and means “invisible.”<sup>611</sup> Here, however, he uses it to refer to the Orion constellation, which Aratus describes as the most visible in the heavens: “Whoever, while gazing up at the heavens on a clear night, misses him spread

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<sup>608</sup> *Ther.2; Phaen.2*. Levitan (1979); Bing (1993); Kidd (1981); Kidd (1997), pp. 164-65.

<sup>609</sup> *Ther.19*.

<sup>610</sup> *Ther.20*. Gow and Schofield (1953), p. 29.

<sup>611</sup> Hes.fr.67 MW; Overduin (2014a), pp.191-92 for a lengthier description of the term.

out on high should trust she will see no other clearer constellation.”<sup>612</sup> Nicander’s use of *αείδελος* is dependent on both Hesiod’s use of the same word and on Aratus’ pronouncement on the visibility of the constellations, but he changes the meaning of the word to the exact reverse: “so bright, it is impossible to look at.”<sup>613</sup> This elaborate wordplay points to the importance of seeing and not-seeing within the poem, and connects it, via the description of the constellation as “περίσημον,” to Aratus’ interest in signs.<sup>614</sup>

The contrast between his own and Aratus’ subject matter that Nicander draws in this opening shows that scholars are incorrect to claim his topic is unimportant. Rather, Nicander shows an acute awareness of the differences between his own subject and Aratus’. We can therefore conclude that Nicander chose his topic very carefully. In fact, the historical evidence supports a picture of a Nicander who has particular interest in toxicology. This was a newly popular subject in the Hellenistic period. Diocles of Carystus, the medical writer, worked on the subject specifically, and Apollodorus composed a prose treatise on the subject.<sup>615</sup> Much of this Hellenistic interest is built on the zoological and botanical work of Aristotle and Theophrastus.<sup>616</sup> Moreover, Nicander

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<sup>612</sup> *Phaen.*323-25: “μὴ ὅτις καθαρὴ ἐπὶ νυκτὶ/ ὑψοῦ πεπητῶτα παρέρχεται ἄλλα πεποίθου/ οὐρανὸν εἰσανιδὸν προοφερέστερα θηήσασθαι.”

<sup>613</sup> Overduin (2014a), p. 192.

<sup>614</sup> Nicander has a particular interest in the experiences of the senses in his poetry, see Sistakou (2012), pp. 202-03; Papadopoulou (2009).

<sup>615</sup> This is the Apollodorus who some scholars believe Nicander uses as his principal source. Scarborough (2003) holds perhaps the extreme position on the subject, writing that, “his borrowing from Apollodorus indicates near-slavish dependence, and Nicander has little comprehension of the toxicology or zoology he carefully purloined.” Scarborough seems very sure when Nicander is using him, even without the scholiasts’ help, considering so few fragments of Apollodorus’ work survive. For the opposing view, Touwaide (1991); Knoefel and Covi (1991); Jacques (2002), pp. xlix-lxiv; (2007), pp. xvi-lxvii. See Hatzimichali (2009) for a balanced approach to Nicander’s knowledge of toxicology.

<sup>616</sup> See Jacques (2002), pp. xx-xlvi; Wick (2009).

may have been under the patronage of Attalus III, who was particularly interested in poisons and toxicology, wrote on the subject, and even cultivated many plants—both poisonous and remedial—in a private garden.<sup>617</sup> Although Nicander focuses on poisonous wildlife, a few of the plant descriptions in the *Alexipharmaca* suggest intentional poisoning, such as when he warns against drinking coriander from *δεπάεσσιν...ἀπεχθομένοισι*.<sup>618</sup> Nicander’s other poetry, including a *Georgica*, an *Ophiaca*, and an *Oetaica* (a work on fish), suggests a personal fascination for the poet with biological diversity and man’s interaction with nature.<sup>619</sup> This is consistent with a Nicander for whom toxicology and pharmacology are important subjects, worthy of writing poetry about and new enough to provide a way for Nicander to distinguish himself from previous scientific poets.

Although it seems a strange subject for poetry to modern readers, Nicander had many possible models of ways to incorporate this type of material into his work. As mentioned previously, in Apollonius’ *Argonautica* Medea performs magic that comes close to pharmacology, and his description of Mopsus’ snakebite is quite detailed in the *sequelae*.<sup>620</sup> Theocritus’ second *Idyll* recounts a spell similar to Medea’s, using many

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<sup>617</sup> Jacques (2002), pp. xvi-xx thinks he was a private toxicologist for the king in Pergamon. Overduin (2014a), pp.7-8, thinks this is unlikely, and I agree. The *Suda* entry for Nicander does state that he was a doctor, but the reliability of this information is suspect, see Overduin (2014a), pp. 6-9; Gow and Schofield (1953), p. 18; Knoefel and Covi (1991), pp. 41-50.

<sup>618</sup> *Alex*.158. It is possible that another reference to intentional poisoning in the final line of the *Alexipharmaca* (630), that bids the addressee, “may guard the law of Zeus Xenios.” (θεσμὸν δὲ Διὸς ξενίου φυλάσσοις.) Overduin (2009) claims that Nicander’s focus is on accidental poisoning, but he is discussing the *Theriaca*, which has much less evidence of an interest in intentional poisoning.

<sup>619</sup> On the fragments of the other works, see Gow and Schofield (1953), pp. 138-67; 201-220.

<sup>620</sup> On Medea’s magic, see Sistikou (2012), pp. 94-95; on Mopsus’ bite, Wick (2009), pp. 288-90. Nicander’s suggestions for herbal remedies often come close to magic, such as his recipe for a snake repellent that requires two snakes mating at a crossroads (*Ther.*98-100), but stay within the realm of medicine, see Sistikou (2012), p. 229.



different types of plants.<sup>621</sup> Posidippus' *Iamatika* describe cures as well, including one of a snakebite, but they are attributed to Apollo and Asclepius, rather than specific plants.<sup>622</sup> The archaic poet Musaeus was known for composing poetry on healing and medicine.<sup>623</sup> Nicander, then, had a wealth of possible generic models; but he chose Aratus' *Phaenomena*.<sup>624</sup>

By connecting his own poetry to the *Phaenomena*, Nicander also connects toxicology to astronomy and meteorology.<sup>625</sup> He does so by appropriating the main theme of Aratus' poem, signs, throughout his own. The philosophical debate about the nature of signs that took place in the third century grew out of a medical discussion about symptoms and identifying the causes of diseases, and so this is a logical connection for Nicander to seize upon.<sup>626</sup> Nicander repeatedly returns to the idea of recognizing signs throughout the *Theriaca*, in order to emphasize the similarities between his own work and that of his most important model. The *Theriaca* uses the word “σήμα” frequently throughout the poem, both for physical aspects of the snake that identify its species and for symptoms of its bite. The viper's fangs *τεκμαίρονται* marks on the skin, for example,

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<sup>621</sup> See Hopkinson (1988), pp.154-57, on Theoc.*Id.*2 and especially pp. 55-56, on the role in it. Overduin (2014a), p. 71, sees less influence of Theocritus on Nicander than Callimachus, which he attributes to the bucolic poet's disinterest in recondite vocabulary.

<sup>622</sup> P. Mil. Vogl.XIV.29 Austin and Bastianini (2002). On the *Iamatika*, see Karanika (2009); Klooster (2009). See also Sider (2005) on 'didactic epigram' in Posidippus, focusing on the meteorological poems.

<sup>623</sup> Ar.*Ra.* 1033, where he is named alongside Hesiod and Homer as a poets who have taught us. See also Sider (2014a), pp. 18-19.

<sup>624</sup> For Nicander's erudition and familiarity with earlier poets, see Magnelli (2010); Overduin (2014a), pp. 71-4.

<sup>625</sup> The relationship between different branches of scientific inquiry in antiquity has been discussed at great length, see Rihll (2002), pp. 9-11 for an overview of the subject; Wilson (2000), pp. 3-13; and Falcon (2005) for the issue of the unity of science in Aristotle's work, which offers our best example. It is likely the answer to this question varied for every author. It is not my intention to wade into this particular issue, nor can we precisely determine, from the works that survive, what Nicander's opinion on the subject may have been. It seems most likely, in light of his Nicander's attempts to tie his own work to the astronomy and meteorology in Aratus' that some degree of separation between the two disciplines.

<sup>626</sup> See Manetti (1993), pp. 36-52.

and Nicander enumerates the κακήθεα σήμαθ' of the Chersydrus snake.<sup>627</sup> Perhaps the most important use of the term in the *Theriaca* is at the beginning of the catalog of non-serpentine venomous animals that marks a halfway point in the poem: “Consider the deeds (ἔργα) of the hungry spider and the signs (σήματα) in its bites.”<sup>628</sup> The two lines give a quick recapitulation of the literary history Nicander constructed at the beginning of the poem, using ἔργα to refer to Hesiod and σήματα to Aratus.<sup>629</sup> This is the word that Nicander chooses to encapsulate the entire poem. Moreover, Nicander emphasizes the idea of humans recognizing signs throughout the poem, as well. The addressee is repeatedly enjoined throughout the poem to take note of the signs of various dangerous creatures, and even the heliotrope plant τεκμαίρει the paths of the sun.<sup>630</sup>

The *Theriaca* is not a poem about the omnipresence of clear and unambiguous signs, however. This is even suggested by the way he emphasizes the unseen nature of his subject matter in the proem. Nicander takes the Aratean theme of signs and uses it to establish his poetic heritage, but his deployment of it demonstrates a different perspective. Nicander’s interests center on the question of mortality and immortality, both biological and literary, and the signs he most cares about, as his acrostic shows, are his own traces in the tradition of scientific poetry.

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<sup>627</sup> *Ther.* 231; 360.

<sup>628</sup> *Ther.* 715-16: “Ἐργα δέ τοι σίνταο περιφράζοιο φάλαγγος/ σήματά τ' ἐν βρυχμοΐσιν.” See p. 196 for discussion of the structure of the poem.

<sup>629</sup> See Overduin (2014a), p. 444.

<sup>630</sup> *Ther.* 680.

### III. Cataloging Nature

One of the most important themes in the development of scientific poetry in the third century is the organization of content. As mentioned in the introduction, systematizing large amounts of information is characteristic of almost all intellectual enterprises in the Hellenistic period. Callimachus' *Pinakes*, Hipparchus' star catalog arranged by brightness, and Theophrastus' botanical works all show a particular concern with the volume of facts available and how to convey them. In poetry, this is responsible not only for the interest in recherché and obscure tidbits of information that can be worked into more famous myths, but also in the way that catalogs are constructed. Nicander's poetry demonstrates a particular interest in the organization of its material, one that emerges in his experimentation with catalogs and reflects the intellectual developments of the previous century. In this section, I will discuss how the structure of Nicander's poetry, especially the *Theriaca*, relates to his models from the third century and experiments with different ways of arranging information.

In Homer, individual entries in a catalog are discrete and can almost always be rearranged.<sup>631</sup> Hesiod's catalogs are not much more coherent. The *Theogony* and the *Catalog of Women* are both grouped into different genealogies, but beyond this, there does not seem to be much organization.<sup>632</sup> In the "Works" section of the *Works and Days*, after progressing straightforwardly from mid-winter until the early Fall, when Hesiod reaches his discussion of sailing, he abruptly switches back to mid-summer and

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<sup>631</sup> On transitivity, which is not always complete, in catalog poetry, especially in Homer, see Sammons (2010), pp. 15-16.

<sup>632</sup> See West (1985), pp. 31-124, especially pp. 38-39.

then to the spring.<sup>633</sup> The “Days” section does not even follow the days in sequential order.<sup>634</sup> Even in a poem about the calendar, Hesiod does not adhere to a strictly chronological organization. Unlike in Hellenistic poetry, the order of a catalog does not seem to have been particularly important to archaic poets.

The catalog was an essential element of epic since Homer, and as such, imitations of it in Hellenistic poetry reflect scholarly debates about its role.<sup>635</sup> As discussed in the Chapter 2, Aristarchus wrote an entire treatise on the Catalog of Ships.<sup>636</sup> Other scholars must have also discussed its order, because Hipparchus and Strabo respond to criticism about the lack of order in the Catalog of Ships as evidence that Homer was not a geographer.<sup>637</sup> This line of argument suggests that organization of information had become another means of demonstrating one’s authority over the material, and Nicander uses it as such.

The various features of both Aratus’ and Apollonius’ catalogs have been discussed in their respective chapters and do not need to be explained in detail here. It is clear that Aratus’ catalog of constellations, which uses the same ekphrastic language as the Shield of Achilles (and of Heracles), is much more precisely arranged than its archaic antecedents. The catalog not only follows a coherent path across the night sky, but also uses that movement from one constellation to another to demonstrate their relationship.

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<sup>633</sup> Hes. *Op.* 504-61; 663; 678.

<sup>634</sup> For example, he moves from the thirteenth day of the month (*Op.* 780-81), to the sixth (782-89), to the eighth (790-91), to the twentieth (792-99), to the fourth (800-01).

<sup>635</sup> Sammons (2010), pp. 3-22, offers a recent survey of the scholarship on Homeric catalogs.

<sup>636</sup> See pp. 166-67 and fn. 540; The arrangement of the remainder of the catalog was not as pressing of an issue, however, as what characters merited inclusion and the history of the places mentioned, see Nünlist (2009) pp. 53-55; 182-84.

<sup>637</sup> See p. 167 and fn. 542.

Transitions are marked by the position of the current constellation relative to previous ones. For example, Aratus describes the location of Ophiuchus: “And to [The Kneeler’s] back the Crown draws near, and by the top of his head, behold the head of Ophiuchus.”<sup>638</sup> This introduction of Ophiuchus connects it both to the Kneeler, the previous constellation, and to the Crown, the constellation that his description of the Kneeler was dependent upon. The poem creates a chain of dependent descriptions that all begin with the two Bears. If the catalog of constellations within the *Phaenomena* were to be cut into the smaller sections on each constellation and rearranged, it would no longer make sense. This is also the case for the paranatellonta. The astronomical sections of the poem only give the correct information in Aratus’ order, although this is not the case for the meteorological section. Apollonius’ arrangement of the Catalog of Heroes is dependent on geography, primarily, although the plot of the poem also informs the order.<sup>639</sup> This organizational strategy is not as essential to comprehension as Aratus’, but it is also important.

Nicander is particularly interested in catalog poetry. Both surviving poems are exclusively catalogic, and the lost poems attributed to him, such as the *Ophiaca* and the *Heteroeumena* (on mythical transformations) probably had a similar format. Gutzwiller connects him to a tradition of catalog poetry specific to his hometown Colophon, as exemplified by Antimachus and Hermesianax.<sup>640</sup> Nicander himself perhaps alludes to this tradition of catalog poetry in the proem of the *Theriaca*, which is addressed to a

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<sup>638</sup> *Phaen.* 74-75: “Νώτω μὲν Στέφανος πελάει, κεφαλῆ γε μὲν ἄκρη/ σκέπτει παρ κεφαλῆν Ὀφιούχων”

<sup>639</sup> See pp. 164-65.

<sup>640</sup> Gutzwiller (2007), p. 106

kinsman named Hermesianax, and in which uses the verb καταλέγω for Hesiod's story of the Titanic origin of snakes.<sup>641</sup> The *Theriaca* signals, from the very beginning, the importance of its catalog structure.

The *Theriaca* is, in fact, not one, but four catalogs.<sup>642</sup> After a brief proem, and a section on avoiding snakes, Nicander offers four alternating catalogs capped with a sphragis at the end.<sup>643</sup> The catalogs alternate between animals that bite (snakes, *Ther.*157-492, other types of venomous animals, 715-836) and botanical remedies for those bites (*Ther.*493-714; 837-956). The catalogs are arranged from longest to shortest, although the second two are so close in length (a difference of only two lines), as to be almost equal. The first catalog of snakes, however, is over a hundred lines longer than the next, and contains the two most famous aetiological passages: the description of the Bane-Helen snake that offers the most extensive mythological narrative and the Dipsas snake passage with the acrostic.<sup>644</sup> It is clear that this catalog, which takes up more than a third of the whole poem, is of central importance to the poem as a whole.

Scholars have frequently criticized the *Theriaca* for its arrangement, stating that it would be more logical and therefore more helpful to arrange the material so that every entry contained a description of the animal, the symptoms of the venom, and the remedies

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<sup>641</sup> *Ther.*3;12. On Hermesianax as addressee, Gow and Schofield (1953), p.7, n. 2, and Σ *Ther.* 3 both reject the possibility that this is meant to be the poet Hermesianax on chronological grounds. Cameron (1995), p. 205, uses this point in his own misguided argument to make Nicander a contemporary of Aratus and Callimachus. Overduin (2014a), p. 173-74, very plausibly suggests that "he is perhaps 'speaking' to Hermesianax of Colophon as a poet of the past."

<sup>642</sup> In fact, it is possible to consider the opening generalities a list of ways to avoid snakes, and therefore a fifth catalog.

<sup>643</sup> *Ther.*1-20; 21-156.

<sup>644</sup> *Ther.*309-19; 345-53.

for the wound, as opposed to dividing the remedies from the other information.<sup>645</sup> This is a rather strange complaint, considering that almost none of the plant remedies in either section of the *Theriaca* are explained as cures for one particular type of bite.<sup>646</sup> Surely, it is more helpful to group all the remedies together, if they are equally viable against all types of snakebites. The *Alexipharmaca*, in contrast, does adhere to the structure described above, and the poem itself is a simple catalog of different poisonous plants, bracketed by a brief proem and a sphragis at the end.<sup>647</sup> Nicander's interest in organizing the entries of the poem seems limited to marking the second entry in the list, white lead, by beginning with the word, "δεύτερα."<sup>648</sup> This is not repeated for any further entries, however. The *Alexipharmaca*'s arrangement also demonstrates the benefits of the organization of the *Theriaca*: most of the remedies are explicitly stated to be emetics, which should be equally effective for all poisons, but are only given as antidotes for one specific plant, limiting their potential usefulness.<sup>649</sup>

It is in the *Theriaca*, therefore, that we can see the most evidence of Nicander's interest in catalog organization. Nicander begins with the snake that offers the most resonance for his interest in catalogs, the asp, on whose namesake both Hesiod and

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<sup>645</sup> Overduin (2014a), p.52, who ascribes it to the prose source Nicander is using; Schneider (1962), p. 37; Effe (1974a), p. 54.

<sup>646</sup> The first catalog of remedies (*Ther.*493-714) is only explicitly defined as being remedies for "νοῦσοι," (*Ther.*493). The only specific species-remedy connections made are: *Ther.*517 (where Nicander claims birthwort (ἔχινος) is a remedy for viper bites, and the etymological connection is likely the only reason for this information being provided); 673 (again, for viper bites); 653-54 (for scorpion and spider bites).

<sup>647</sup> *Alex.*1-11; 629-30. On the arrangement of the *Alexipharmaca*, see Jacques (2002), lxxxiii.

<sup>648</sup> *Alex.*74.

<sup>649</sup> Remedies are explicitly described as emetics at *Alex.*89; 136-38; 195-96; 226-27; 360-62; 459; 535-36; 584-85.

Homer composed ekphrastic catalogs.<sup>650</sup> Nicander describes how the snake, roused to attack, “winds a wheel-like ring (τροχόεσσαν ἄλων) with its body upon the ground, and through the middle it rears its bristling head perniciously,” offering a visual echo of the Ocean that surrounds Achilles’ shield in the *Iliad*.<sup>651</sup> At the beginning of the snake catalog, Nicander adopts Aratus’ method of linking items in the list by connecting them to previous ones. Both Aratus and Apollonius have a spatial arrangement that limits the order in which they can list their catalog entries, but Nicander does not have the same constraint, leaving him free to experiment with how he connects different entries in his catalog.

Almost every snake in the catalog is described, in part, by its similarity to a snake that was already described, creating chains of association. The first of these chains works in basically the same manner as Aratus’ transitions between constellations, using the relationship to the immediately preceding list entry as a transition into the next description. For example, after describing the Viper, Nicander transitions to the next snake by saying that, “may you learn well the wily Cerastes, attacking like a Viper,” and the bulk of the Cerastes’ description alternates between attributes of the Viper and how the Cerastes resembles or differs from it.<sup>652</sup> The next snake, the Haimorrois Snake, “limping along slantwise like the Cerastes, it always steers its little body along its humble

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<sup>650</sup> Scarborough (1977), p. 6, claims that Nicander’s first snake is the dipsas, which is incorrect. On the connections between ekphrastic and catalog poetry, see Semanoff (2006).

<sup>651</sup> *Ther.*166-67: “Ἐλκῶ δὲ τροχόεσσαν ἄλων εἰλίξατο γαίῃ, /λευγαλέον δ’ ἀνὰ μέσσα κάρη πεφοικῶς ἀείρει.”

<sup>652</sup> *Ther.*209-57;258-59.



course from the middle of its back.”<sup>653</sup> The Sepedon, in turn, looks like the Haimorrois, but moves straightforwardly.<sup>654</sup>

The chain described above only works in the order in which Nicander presents these snakes, but after this, he complicates the pattern and begins to jump back to earlier snakes rather than moving in sequential order, such as in his description of the Chersydrus, which resembles the Asp, the very first snake mentioned.<sup>655</sup> The organization of the snake catalog becomes even more complicated at the end, where Nicander says that “with its flat head, it looks like the Hydrus.”<sup>656</sup> No Hydrus is mentioned in the poem, upsetting the pattern established with the earlier species. Overduin believes that this refers to the Chersydrus snake, which is mentioned in the catalog at *Ther.*359-71.<sup>657</sup> If this is the case, the comparison offers one of the many etymological puns in the poem, as Nicander has already given us an alternate name for the Dryinas, the Chelydrus. The comparison then links the snake to a previous entry and explains its name. The Hydrus is also a snake in its own right, however, and it is possible that Nicander is varying a formula that he established at the beginning of the catalog by suddenly using a previously unmentioned snake. Aratus describes a Hydrus in his own etymological game about different water-based animals giving signs of rain, and Nicander is unlikely to have

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<sup>653</sup> *Ther.*294-95.

<sup>654</sup> *Ther.*320-21.

<sup>655</sup> *Ther.*359-60.

<sup>656</sup> *Ther.*420-21: “κάρη γε μὲν ἀρπεδέξ αὐτῶς/ ὕδρω ἐισκόμενος”

<sup>657</sup> Overduin (2014a), p. 337.

omitted this one particular snake reference in the *Phaenomena*, given his particularly enthusiastic appropriation of the literary references to snakes.<sup>658</sup>

If the snake referred to here is the already-mentioned Chersydrus, as Overduin thinks, the association is still problematic. Nicander likens the Dryinas to the snake in appearance, but his description of the Chelydrus focuses on the symptoms of the snake's bite, and only describes its physiognomy as akin to the Asp. Moreover, the description of the Asp also contains no information about the shape of its head. This constructs another chain of association throughout the catalog, but here, the relevant piece of information, the flatness of the snake's head, is only given in the last entry of the chain. Whereas in previous chains, understanding the later snakes was contingent upon the earlier entries, here, a new piece of information about the very first snake is only presented in one of the last snakes Nicander describes. The connections between these snakes have shifted direction, demonstrating Nicander's experimentation with the catalog format.

In the following section of the poem, the first remedy catalog, Nicander develops these associations even further. The necessary botanical ingredients are often compared to other plants, but these are all to plants unmentioned previously in the poem:

Indeed, thickly-shaded birth-wort (ἀριστολόχεια) should be celebrated, bearing ivy-like leaves just like honeysuckle (περικλυμένοιο), but its flowers are bright red, and its fragrance disperses heavily, and you will see fruit in the midst of it like the wild pear from either the *murtas* pear-tree or the *bacche* kind. The root of the female is rounded in its bulk, but the male is long and reaches a depth of a cubit, and in color it is similar to the boxwood of Oricus.

Ἦτοι ἀριστολόχεια παλίσκιος ἐνδατέοιο,  
φύλλ' ἄτε κισσήεντα περικλυμένοιο φέρουσα·  
ἄνθεα δ' ὑσγίνῳ ἐνερεύθεται, ἣ δέ οἱ ὀδμή

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<sup>658</sup> *Phaen.*946. See Magnelli (2006a), pp. 189-91.

σκίδνεται ἐμβαρύθουσα, μέσον δ' ὡς ἀγράδα καρπὸν  
μυρτάδος ἐξ ὄχνης ἐπιόψει ἢ σύ γε βάκχης·  
ρίζα δὲ θηλυτέρης μὲν ἐπιστρογγύλλεται ὄγκῳ,  
ἄρσενι δ' αὖ δολιχὴ τε καὶ ἄμ πυγόνος βάθος ἴσχει,  
πύξου δὲ χροιῆ προσαλίγκιος Ὠρικόιο. (*Ther.* 509-16)

In this passage, birth-wort is compared to an ever-increasing number of plants, including the mini-chain comparison of the birth-wort resembling honeysuckle, which resembles ivy, and the detailed comparison to several different species of pear tree. None of these plants is mentioned elsewhere in the poem, so the only way for this information to be useful is if the reader is already familiar with them. The associative comparisons that provided an organizing structure in the first catalog have now been rendered completely meaningless.

Instead, a different pattern is used for this catalog, one that perhaps draws more from Callimachus' arrangement in the *Aetia* than from Aratus. Overduin has argued convincingly for a structural arrangement of the second catalog marked by two stories about an otherwise unknown figure name Alcibius, who discovers one botanical remedy when he is bitten by a Viper, and another when his dog is.<sup>659</sup> The identity of Alcibius baffled the scholiasts, and he is not mentioned anywhere else.<sup>660</sup> Nicander has probably either succeeded in finding the most obscure myth to incorporate into his poem or has simply invented the character himself.<sup>661</sup> The positioning of the stories suggests that Nicander takes Callimachus' catalog structure in the *Aetia*, with external bracketing by

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<sup>659</sup> *Ther.* 541-49; 666-76. See Overduin (2013).

<sup>660</sup> Overduin (2014a), p. 57, n.236; Overduin (2014b).

<sup>661</sup> The internal bracketing of the catalog with these two stories suggests another possibility, however. Callimachus arranged the second half of his catalog poem around the stories connected to Berenice, and it is likely that Nicander's allusions to Alcibius are an echo of this. It is therefore also possible that this was an actual historical figure, although it is much more likely that Nicander simply created the character. On Callimachus' framing device of the second half of the *Aetia*, Harder (2007), pp. 33-37.

the Muses and then Berenice, and alters it, moving the framing from the outside to the inside, but the evidence does not allow a full understanding of how the *Aetia* influenced Nicander.

Within both of the botanical remedy catalogs, Nicander's neatly delineated catalog entries give way to a messy accumulation of plant names, which has led some scholars to complain that it is not possible to determine where one recipe ends and another begins.<sup>662</sup> Jacques attempts to chart the remedies into some sort of organization based on simple and compound remedies, and those that use the root, the leaves, or the seed of a plant, but the pattern is either too complex or incomplete.<sup>663</sup> The physical effects of these plants, unlike those of the snake and insect venoms, or of the poisonous plants in the *Alexipharmaca*, are not described. That they are curative is apparently sufficient information. This, and the lack of clear distinctions between recipes, combine to create an impression within the botanical catalogs of an abundance of possible treatments, without drawing focus from the horrific descriptions of envenomation in the other catalogs. The emotional effects of the two different types of catalogs with the poems are both shaped by their structure.

The final two catalogs mirror their respective predecessors in structure, but with less intricacy. Overduin explains the lack of architectonic complexity in the two later catalogs by comparison to the meteorology in Aratus' poem:

When compared to Aratus, such a lack of coherence is not problematic at all, considering the fact that the second part of the *Phaenomena*, known as the

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<sup>662</sup> Overduin (2014a), pp. 56-57.

<sup>663</sup> Jacques (2002), pp. lxxv-lxxvi.

Diosemeia, similarly consists of various weather signs, lacking the overall structural and methodical consistency of the first part.<sup>664</sup>

Overduin has underestimated the complexity of the organization of the *Phaenomena*, as outlined in Chapter 1. But Nicander's second animal catalog is still methodical. The animals in the second zoological catalog are grouped into species: spiders, scorpions, bees and wasps, and a final collection of miscellaneous venomous animals.<sup>665</sup> Even within this less organized passage, Nicander also separates terrestrial animals from nautical animals, a topographical device that Aratus also uses, when he separates zoological weather signs into those from animals in the air, in the sea, and on land.<sup>666</sup> The *Theriaca*'s two catalogs of venomous animals represent a zoological taxonomy, with snakes separated from insects, and the insects broken down into species.<sup>667</sup>

This is a vast improvement over the organization of Aristotle's *Historia Animalium*, the most complete surviving zoological treatise. Nicander had almost certainly read Aristotle's zoological works, in view of the specific verbal echoes of that work that have been found in the poem.<sup>668</sup> One of the most frequent modern complaints about the *Historia Animalium* is its lack of organization or systematic taxonomy, a grievance subtly present in the common description of the work as a "farrago."<sup>669</sup> This criticism was apparently also lodged in antiquity, as it prompted Aristophanes of

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<sup>664</sup> Overduin (2014a), p. 444.

<sup>665</sup> *Ther.* 715-69; 770-804; 805-810; 811-36.

<sup>666</sup> *Ther.* 811-21; 822-36.

<sup>667</sup> See pp. 211-15 below on species of snakes

<sup>668</sup> See Jacques (2002), pp. lxxxv-ciii. On the use of Aristotle's biological works in Hellenistic poetry more broadly, see Asper (2009).

<sup>669</sup> See for example Medawar and Medawar (1983), p. 28, in which it is described as "a rather tiresome farrago of hearsay, imperfect observation, wishful thinking and credulity amounting to downright gullibility."

Byzantium to write an epitome of the work in the early second century BCE.<sup>670</sup>

Theophrastus improved on Aristotle's biological works in part by creating a taxonomy, although it was limited to botany.<sup>671</sup> Nicander's work, while much more limited in scope than either Theophrastus' or Aristotle's, takes the Theophrastean improvements and imposes them on his own zoological material as well.

Nicander's interest in catalogs is both poetic and scientific. He experiments with different models for organizing large amounts of information that were in use in prose scientific works, non-scientific poetry, and, of course, Aratus' scientific poetry. His interest in organizing information is one way in which he demonstrates his familiarity with previous models and innovates upon them. Implicit in his organization, however, are many claims about which snakes can be categorized as the same species and which ones are different. In the following section, I will explore how this relates to his interest in language and its flexibility.

#### **IV. Definition and Ambiguity in Language and Taxonomy**

The most distinctive aspect of Nicander's poetry is his language, which is perhaps also the reason for his lack of popularity.<sup>672</sup> Enrico Magnelli writes that, "Nicander challenges even the most patient reader. His language is full of rare words, new coinages, and morphological peculiarities, and his style is the opposite of clear and

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<sup>670</sup> Ar.Byz.*Epit.*2.1, see Hatzimichali (2009), p. 33.

<sup>671</sup> On Theophrastus' biological works and their relationship to Aristotle's writings on the same subject, see French (1994), pp. 83-103.

<sup>672</sup> On the language of Nicander, Klauser (1898) was the first systematic study. See also Jacques (2002), pp. xcii-cxxiii; Overduin (2014a), pp. 63-91.

concise.”<sup>673</sup> The difficulty of reading Nicander’s Greek has led to a disproportionately high amount of the bibliography on his works focusing exclusively on textual matters, to the exclusion of more thematic concerns.<sup>674</sup> Effe even claimed that Nicander’s poetry is more about language than about snakes.<sup>675</sup> Our readings of Nicander’s Greek suffer perhaps from his belatedness. He uses the same language prevalent in other Hellenistic poets, one that is modeled on attested Homeric language but also full of innovations based on archaic word formation.<sup>676</sup> But he also does much the same to the language of his Hellenistic (and pre-Hellenistic) predecessors, adding a further level of complexity, one that is compounded by the loss of so much of his reference material.<sup>677</sup> Playing with Callimachus’ Greek in the same manner Callimachus applied to archaic poets, Nicander often stretches the meaning of terms that we can only barely understand in their original usages, and *oppositio in imitando* is one of his favorite literary devices.<sup>678</sup> Moreover, Nicander’s subject matter naturally lends itself to the inclusion of many plant names, and he seems to have had a particular predilection for working the names of obscure and otherwise unknown plants into his poetry, leading to a rather high number of species known only from his work and almost impossible to identify.<sup>679</sup> As Magnelli points out, Nicander’s Greek is not quite as difficult as modern scholars make it out to be.<sup>680</sup> The poet offers many instances of altering the gender or the morphology of a word, but, aside

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<sup>673</sup> Magnelli (2010), p. 215

<sup>674</sup> For example, White (1987), Cazzaniga (1957); (1966) (1973); Touwaide (1997).

<sup>675</sup> Effe (1977), pp. 57-58.

<sup>676</sup> See Magnelli (2010), 213-16; Overduin (2014a), pp. 67-69.

<sup>677</sup> Especially, Euphorion, Hermesianax, and Antimachus of Colophon, see Gutzwiller (2007), p. 106.

<sup>678</sup> Magnelli (2010), p. 214.

<sup>679</sup> Many scholars have attempted to identify the precise species Nicander names, often with very little evidence to go on, see especially Scarborough (1977); (1979); Leitz (1997).

<sup>680</sup> Magnelli (2010), p.215. Also noted by Jacques (2002), pp. xciv-ciii.

from the aforementioned plant names, he does not employ too many “inscrutable dialectal glosses.”<sup>681</sup> The poem is by no means incomprehensible. To a reader well-versed in Nicander’s literary precedents and comfortable with inconcinnity and irregularity, his language probably would not appear as thoroughly bizarre as it does to modern readers.

Nicander does seem to call attention to his idiosyncratic use of language, however. The proem of the *Theriaca* opens with a grammatical mistake:

The hardworking ploughman and the cowherd and the woodcutter, whenever in the woods or while ploughing something might cast its baneful tooth upon him, will respect you, being knowledgeable about such remedies for illness.

σέ δ’ ἄν πολύεργος ἀροτρεύς  
βουκαῖός τ’ ἀλέγοι καὶ ὀροϊτύπος, εὔτε καθ’ ὕλην  
ἢ καὶ ἀροτρεύοντι βάλῃ ἐπι λοιγὸν ὀδόντα,  
τοῖα περιφρασθέντος ἀλεξιτήρια νούσων. (*Ther.* 4-7)

The anacoluthon between the accusative pronoun and the participle modifying it makes the elliptical nature of this statement even more difficult to understand, especially because the two words are so distant from one another. It is likely that Nicander is imitating a grammatical irregularity present in Homer, such as at *Il.* 20.413-14: “τὸν βάλε μέσσον ἄκοντι ποδάρκης δῖος Ἀχιλλεύς/ νῶτα παραίττοντος.”<sup>682</sup> Nicander also seems to be playing with variations of usage with the verb ἀλέγω, which usually takes a genitive object, but occasionally an accusative.<sup>683</sup> Nicander makes this Homeric grammatical allusion while celebrating his addressee for his learnedness, making the desired audience of the poem clear, and suggesting that any further errors we find in the poem are also

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<sup>681</sup> Magnelli (2010), p. 215.

<sup>682</sup> See Overduin (2014a), p.179.

<sup>683</sup> LSJ s.v. A.II.1-2.



intentional, and designed for us to find them. In the following section, I will consider how Nicander emphasizes the polysemous nature of his language and connects ambiguity of names to the ambiguity of nature. The ease of the reader may not be his primary goal, but that does not prevent the work from having a scientific agenda. In fact, Nicander's interest in lexical variation and recondite terminology allows him to enter into an important debate in biological works of the time, the issue of species identification.

There are many instances in which Nicander's meaning is ambiguous, seemingly intentionally. Nicander describes a Viper biting, "οὐλόφ...στομίφ," and scholars debate whether this should be interpreted as "with its whole mouth" or "with its baneful mouth."<sup>684</sup> The former meaning seems more likely from context, as Nicander continues, "and you should notice the jaws easily extending about the flesh."<sup>685</sup> But throughout the poem Nicander uses heightened, epic language to describe snakes, and the gruesomeness of the idea of a snake unhinging its jaw and opening its mouth wide is surely also active here. This is a common occurrence in Nicander's poetry and translators are often forced to choose one meaning as dominant, even though they are usually both relevant. The language of the *Theriaca* and the *Alexipharmaca* shows a particular interest in the ambiguities of language and the range of possible linguistic expression.

One potential such polysemous word choice occurs in the sphragis of the *Theriaca*: "May you always have a remembrance of Homeric Nicander, whom the snowy

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<sup>684</sup> *Ther.*233. Translations from Overduin (2014a), p. 278; Gow and Schofield (1953), p. 42, and Jacques (2002), p. 20, give the former, Spatafora (2007), p. 59, uses the latter interpretation: "con sua bocca esiziale."

<sup>685</sup> *Ther.*233-34.

little town of Claros reared.”<sup>686</sup> This is typically read as, at least partially, a reference to the claim Colophon held to being the birthplace of Homer.<sup>687</sup> But the final word of the poem, “πολίχνη” is a diminutive of “πόλις,” but it is also the name of a town on the island of Chios, another claimant to the title of Homer’s hometown.<sup>688</sup> Nicander uses the ambiguity of language to refer to an ambiguity in the poetic legacy of Homer.

The first word of the *Theriaca*, “ῥεῖα,” seems to laugh at the reader’s difficulties.<sup>689</sup> Because of this, it is easy to see Nicander’s interest in lexical oddities as an exclusively literary trait, hindering any scientific or didactic program rather than furthering it.<sup>690</sup> Indeed, Nicander’s wordplay is steeped in allusions to archaic poetry. One of Nicander’s most charming puns describes a spider (φάλαγγος) “creeping with its feet one after another,” (ἐπασσύτεροις ποσὶν ἔρπων).<sup>691</sup> The description of the spider’s movement is a reference to a line in the *Iliad* describing Greek soldiers moving uniformly: “ἔπασσύτεραι...φάλαγγες.”<sup>692</sup> The pun between the spider and the phalanx is never expressed in the poem, but relies on the reader’s knowledge of the Homeric

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<sup>686</sup> *Ther.*957-58: “Καὶ κεν Ὀμηρείοιο καὶ εἰσέτι Νικάνδροιο/ μνηστὶν ἔχοις, τὸν ἔθρεψε Κλάρου νιφόεσσα πολίχνη.”

<sup>687</sup> Jacques (2002), p. lxxi; Magnelli (2010), pp.216-17; Overduin (2014a), p.534. As all these scholars point out, there is sure a metapoetic significance as well, although the exact valence of it isn’t clear. Nicander’s terminology, even the epicizing genitive “Ὀμηρείοιο,” is probably also relevant, and Jacques, *ibid*, wants to see this as a claim that Nicander is an emulator of Homer, perhaps as a way of inserting himself into the debate about whether Aratus modeled his poetry on Homer or Hesiod, as discussed in the fn. 161 and p. 182. Pasquali (1913), p. 89, suggests a connection to the Homereion and its guild of poets in Colophon, which seems very likely.

<sup>688</sup> Mentioned in Herodotus, 6.26.2. Also the name of a few other places, including in Ionia, Thuc.8.14. See Overduin (2014a), p.538

<sup>689</sup> Clauss (2006), p. 164.

<sup>690</sup> Overduin (2014a), p.1, includes “diction” in his list of ‘literary’ elements of the poem which will be his focus, to the exclusion of “herpetology, botany, biology, entomology, pharmacology, or medicine.”

<sup>691</sup> *Ther.*715-717.

<sup>692</sup> *Il.*4.427. See Overduin (2014a), p. 447

precedent, much like the anacoluthon in the proem. Nicander's wordplay is designed to dazzle the reader with his linguistic virtuosity.

It does, however, also affect the didactic effectiveness of the poem. The reader who misses the spider pun can still comprehend Nicander's meaning, but some of the allusions to earlier poetry are necessary in order to understand his word choice and to appreciate fully his aesthetic goals. Nicander also takes vocabulary from Homer and Hesiod and changes their meaning, such as the term "ιοειδής," a word used in Homer and Hesiod, to mean violet-colored, or purple.<sup>693</sup> Nicander uses the term to describe a fluid emitted by the wound of a snakebite and the stinger of a scorpion.<sup>694</sup> Modern translators disagree about whether to interpret the word as etymologically connected to "ἴον," violet, as it clearly is in the archaic usages, or to "ἰός," poison, a central theme of the poem.<sup>695</sup> The ambiguity here does little to help the reader, and may actually confuse her, but knowledge of the Homeric and Hesiodic usages underscores the connection between the color, the violet plant, and poison. This seems to be Nicander's main objective with this particular term; he also describes the "μέλας ὀλοφώιος ἰός" of the sepedon, managing to tie the word to both color and lethality at the same time.<sup>696</sup>

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<sup>693</sup> Typically of water, *Il.*11.298; *Od.*5.56; 11.107; *Hes.Th.*3; 844. See also Overduin (2014a), p. 280.

<sup>694</sup> *Ther.*243; 886

<sup>695</sup> Gow and Schofield (1953), translate as "dark-blue" for the fluid and "poisonous" for the stinger. Jacques (2002), translates both without reference to color: "le venin funestre" and "l'aiguillon venimeux," respectively. Overduin (2014a), p. 280, points out that "poisonous-looking" makes little sense semantically, and, p. 510, for a comparison based on appearance, the poisonous-nature of the stinger seems irrelevant to recognizing the plant.

<sup>696</sup> *Ther.*327

Nicander employs the same kind of ambiguity in his wordplay about the names of species, capitalizing on the fact that many plants and animals have the same name.<sup>697</sup> For example, one recipe calls for the stalk of the σκολόπενδρον plant, but later he warns about the “two-headed σκολόπενδρα [centipede], who furnishes death to men from both ends.”<sup>698</sup> Moreover, anatomical terms are used interchangeably, such as when he describes the effects of the Grape spider’s bite on the victim’s “καυλός,” or penis, using a term typically used for the stem of a plant.<sup>699</sup> Nicander’s wordplay calls attention to the ambiguity of names in representing both harmful and healing aspects of nature.

Nicander’s intricate wordplay is frequently used to explain the names of animals and plants within his poem with etymology.<sup>700</sup> He draws parallels between the animals and the symptoms of their bite. As discussed in section 2, he connects the Dipsas snake to the thirst it evokes in its victims, and similarly, the bite of the Haimorrois snake causes blood to flow out of most orifices, and the blue spider induces an “ἔμετον...λοιγὸν αραχνήεντα.”<sup>701</sup> Other etymological games in the poem explain the names of snakes by their behavior: the Dryinas snake lives in oak trees and the Chersydrus lives both in water and “ἐν χέρσῳ.”<sup>702</sup> Similarly, some plants obtain their name from the animal whose bites they protect against, such as the Echion plant named for repelling Vipers, the “same-

<sup>697</sup> On the use of the same names for plants and animals, see Strömberg (1940).

<sup>698</sup> *Ther.* 684; 812-13: “Ἐμφικαρῆς σκολόπενδρα, / ἔτε καὶ Ἐμφοτέρωθεν ἔπάζεται ἔνδρασι κῆρα.”

<sup>699</sup> See LSJ s.v. A.I; III, and Overduin (2014a), p. 450, who states that this is the first usage of the term with this meaning. For a more general discussion of the use of plant anatomical terms for male genitalia, see Ruf. *Onom.* 101-102; Adams (1982), pp. 26-27.

<sup>700</sup> See Overduin (2014a), pp. 74-76; O’Hara (1996), pp. 40-41.

<sup>701</sup> *Ther.* 339; 282-208; 732-33. This last example, of course, does not exactly explain the name of the spider, but does contribute a parallel between the animal inflicting the bite and its symptoms.

<sup>702</sup> *Ther.* 412; 369.

named Drakon plant,” and the Scorpius plant, “which looks like the purple/poisonous stinger of the beast,” in the *Theriaca* and is “always shaped like a stinger,” in the *Alexipharmaca*.<sup>703</sup> Plants also get their names from their properties, like the heliotrope, whose leaves follow the turning of the sun, and the adianton, or “unwettered” plant, which takes its name from the fact that drops of water do not stick to it.<sup>704</sup> Although this practice is observable in earlier poets, especially Hesiod and Aratus, these types of etymological explanations of names occur at a much higher frequency in Nicander.<sup>705</sup>

Nicander also exhibits a particular interest in collecting and reconciling different names for the same species. In his description of Aconite, the very first poisonous plant in the *Alexipharmaca* and the longest individual entry in the poem, Nicander offers a cavalcade of multiple names:

This plant they call Mouse-slayer (μυοκτόνον), for it completely lays waste to annoying, gnawing mice; and others call it Leopard-bane, because cowherds and goatherds fashion doom for the monstrous beasts with it in the meadows of Ida, in the glens of Phalacra. And often it is called woman-killer (θηλυφόνον) or lobster (κάμμαρον). And noxious Aconite grows in the Aconaeon mountains.

τὴν μὲν τε κλείουσι μυοκτόνον, ἧ γὰρ ἀνιγρούς  
 παμπήδην ὕρακας λιχμήμονας ἠρήμωσεν·  
 οἱ δὲ τε παρδαλιαγχές, ἐπεὶ θήρεσσι πελώροις  
 πότμον βουπελάται τε καὶ αἰγινόμητες ἔθεντο  
 Ἴδης ἐν νεμέεσσι Φαλακραίῃ ἐνὶ βήσση,  
 πολλάκι θηλυφόνον καὶ κάμμαρον· ἐν δ’ Ἄκοναίοις  
 δηλήειν ἀκόνιτον ἐνεβλάστησεν ὀρόγχοις. (*Alex.*36-42)

<sup>703</sup> Viper bugloss: *Ther.*541-547; Drakon plant: *Ther.*882, “ὀμοκλήτοιο δράκοντος”; Scorpius plant: *Ther.*886-87, “θερὸς ἰσαζομένην...ἰοειδεὶ κέντρῳ”; *Alex.*145-46: “σκορπιόεντα...ρίζεα...αἰεν κεντρήεντα.”

<sup>704</sup> *Ther.*678-80; 846-47.

<sup>705</sup> Overduin (2014a), p. 75. For etymological puns in Hesiod, such as that connection Aphrodite’s name to the word for foam (*Th.*191), see West (1966), p.88. On etymology in Aratus and its didactic function, see Kidd (1997), pp. 243;301;307-08, and pp. 67-68 in this dissertation. On etymology as a feature of Hellenistic poetry, O’Hara (1996), pp. 21-42.

Within this section, moreover, he also refers to a remedial plant as Horehound (πρασίω), which he then glosses as μελίφυλλον, and he even offers two names for the part of the intestine most affected by the poison: the “heart of the stomach” (κραδίην ἐπιδορπίου) and the “receptacle of the gullet” (δοχαίην...στομάχιο).<sup>706</sup> Nicander uses this passage to explore the wealth of names that are used for the same thing.

This interest in names and especially in consolidating different names for the same species reflects a burgeoning trend in Hellenistic biology, one that was first developed by Theophrastus, that of separating out individual species and assigning names for them.<sup>707</sup> The terms that Nicander uses as names of specific snakes, such as ἔχις, δρακόν, and ὕδρος are used interchangeably in earlier poetry to mean a generic snake, with little evidence of species identification. For example, Homer calls the snake that bites Philoctetes a ὕδρος, whereas Sophocles refers to it as an ἔχιδνα.<sup>708</sup> In contrast, these words are used for distinct species in the *Theriaca*. Nicander has a particular interest in how species are divided. He discusses, for example, the differences between the European and Asian Viper (ἔχις), but still maintains that they are part of the same species, both by using the same name and combining the two into one catalog entry.<sup>709</sup> Nicander’s species identification is usually understood to be derived from Theophrastus’ lost work on different kinds of snakes, possibly through the intervening influence of

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<sup>706</sup>This presumably refers to an anatomical debate that is now lost, and there is some discussion among the scholiasts about what exactly Nicander is referring to, see Jacques (2002), pp. 64-65. There is a similar comment at Ther.579-80, where Nicander offers as alternative names for the testes of a stag, “sea-urchin,” (ἐχίνον) and “intestinal pouch” (ἐγκατόεντα κεκρύφαλον).

<sup>707</sup>Wick (2009), p. 277; Leitz (1997).

<sup>708</sup>*Il.*2.723; *Soph.Ph.*267; 632. See Wick (2009), p. 279, who also points out that there does not seem to have been a distinction made between ἔχιδνα and ἔχις, except possibly by sex.

<sup>709</sup>*Ther.*209-218.

Apollodorus.<sup>710</sup> Nicander is not merely recapitulating Theophrastus' taxonomy, however, which seems to have used “διαφοραί” between animals as the primary determining factor in creating species.<sup>711</sup> The emphasis on the difference with the vipers, combined with the repeated similes that call attention to the resemblances between types of snakes as discussed in the previous section, demonstrate the very complicated ways in which categories in biological taxonomy are determined.

This interest in the multiplicity of names for different kinds of snakes reflects Nicander's use of previous sources. By calling attention to the alternative possibilities, he shows his awareness of the discrepancies in the texts he is reading and his own attempt to make sense of them. It is possible that these references come from debates between different medical and biological writers and that some of Nicander's decisions about where to draw the lines between different species and what names to assign to which kinds of snakes are in response to debates on this subject, but the evidence is lost.

The Hydrus snake offers a particularly problematic issue for species identification:

Learn of the death from the Dryinas, which others call the Chelydrus. It fashions its homes in oak trees (δρυσίν), or in Valonia oaks (φηγοῖσιν), perhaps, and lives in the mountains in glens. Some call it the Hydrus, but others the Chelydrus, who, leaving the marsh plants (βρύα) and the swamp and its accustomed pool, and hunting locusts and frogs in the meadows, it hurries away, receiving an unaccustomed attack from a gadfly. Then, it slips into the trunk of a hollow oak, curling up tightly, it builds up a bed in deep brush. Its back is sooty, and its head

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<sup>710</sup> See Wick (2009), p. 280; Jacques (2002), pp. xxx-xxxiii. The title of Theophrastus' work was Περὶ τῶν δακετῶν καὶ βλητικῶν, possibly dividing snakes (biting animals) from other poisonous animals (stinging ones, namely), as Nicander does. This does not mean Nicander was blindly following Theophrastus, as Nicander's division is not entirely determined by the method of venom injection: Spiders, which he explicitly states bite their victims (*Ther.* 715-19) are grouped with the other insects.

<sup>711</sup> Wick (2009), p. 280; French (1994), p. 94.

flat is like a Hydrus, and from its skin wafts an awful smell, like when bending around damp hides and horse-skins, bits of leather sweat at the knives of tanners.<sup>712</sup>

Κῆρα δέ τοι δρυΐναο πιφαύσκεο, τόν τε χέλυδρον  
ἐξέτεροι καλέουσιν· ὁ δ' ἐν δρυσὶν οἰκία τεύξας  
ἢ ὄγε που φηγοῖσιν ὀρεσκεύει περὶ βήσσας  
ὔδρον μιν καλέουσι, μετεξέτεροι δὲ χέλυδρον·  
ὅς τε βρύα προλιπῶν καὶ ἔλος καὶ ὀμήθεα λίμνην  
ἀγρώσσω λειμῶσι μολουρίδας ἢ βατραχίδας  
σπέρχεται ἐκ μύωπος ἀήθεα δέγμενος ὀρμὴν.  
ἔνθα κατὰ πρέμνον κοίλης ὑπεδύσατο φηγοῦ  
ὄξυς ἀλείς, κοῖτον δὲ βαθεῖ ἐνεδείματο θάμνω.  
αἰθαλόεις μὲν νῶτα, κάρη γε μὲν ἀρπεδὲς αὐτως  
ὔδρω εἰσκόμενος· τὸ δ' ἀπὸ χροὸς ἐχθρὸν ἄηται  
οἷον ὅτε πλαδόωντα περὶ σκύλα καὶ δέρε' ἵππων  
γναπτόμενοι μυδῶσιν ὑπ' ἀρβήλοισι λάθαργοι. (*Ther.*411-23)

This passage offers a number of assertions about species identification, some of which are in conflict with each other. At first, it seems that there are three possible names for the same snake, Dryinas, Chelydrus, and Hydrus, but he also compares the snake to a Hydrus at line 421, implying that it is a different species. It is therefore possible to read the alternative names in 414 as incorrect names that people use for the Dryinas snake because it is typically aquatic.

This is complicated by Nicander's earlier reference to another aquatic snake that occasionally comes to land, the Chersydrus. This snake merited its own catalog entry, and so it is probably a distinct species.<sup>713</sup> Overduin believes that the Chelydrus is the same as the Chersydrus, however, given their similar-sounding names and semi-aquatic,

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<sup>712</sup> Line 414 is athetized in Gow and Schofield (1953), see Wick (2009), pp. 282-83, who explains it was originally rejected by J.G. Schneider (1816), because it neither occurred in the prose paraphrase of the poem by Euctenius, nor was a lemma in the scholia. This suggestion was then followed by O. Schneider (1856), on whom Gow and Schofield (1953) were very reliant. Both Jacques (2002) and Overduin (2014a) accept the line without comment.

<sup>713</sup> *Ther.*359-71.



frog-hunting behavior.<sup>714</sup> Later toxicological treatises do not mention a Chelydrus snake, suggesting that it had been subsumed under the species of the Chersydrus, but Latin poets still use the term Chelydrus as a distinct species, probably taking it from Nicander or his Latin imitator, Aemilius Macer.<sup>715</sup> The symptoms of the bites of the Chersydrus and Chelydrus are sufficiently distinct, however, to show that although the reader should see the similarities between these two snakes, Nicander does not consider them the same species. The best interpretation, in my view, is that the Dryinas and the Chelydrus are two names for the same snake, and that the Chersydrus is a related but distinct species. Whether the Hydrus should be identified with either of these two species, or a third, otherwise unmentioned snake, remains unclear. What emerges most clearly is Nicander's interests in species differentiation and its problems, rather than any specific position on this issue. Nicander's language forces the reader to think about the meanings of words as flexible and dependent on context. Connections between the names of things and the signified plants, animals, or even body parts creates a framework in which Nicander can explore how we sort and group biological species. Nicander offers no easy answers in either his language or his biological taxonomy, but that seems to be his point. It is necessary to organize our information about animals into clear categories, but understanding the relationships between those groups and the ways they blur into each other is important as well.

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<sup>714</sup> Overduin (2014a), p. 337.

<sup>715</sup> E.g., Verg. *Georg.* 2.214; 3.415; *Ov. Met.* 7.272; *Luc.* 9.711. See Jacques (2002), p. 134, n. 44, and especially p. 122, n. 35, where he refers to the chelydrus as “un Serpent très voisin [to the chersydrus].” Jacques also points out that chelydrus is now used for modern zoological names for turtles, but this is hardly relevant.

## V. Nature vs. Knowledge

One debate in Nicandrian scholarship addresses his overall outlook on the world.

Although neither surviving poem offers as much evidence of philosophical thought as Aratus' *Phaenomena*, they do provide a picture of the natural world and of the place of mankind within it. It is therefore not at all unanticipated that scholars would discuss the picture Nicander provides in order to gain some perspective on the poet's own feelings about the world. What is surprising, however, is that scholars have managed to come to diametrically opposed conclusions. Evina Sistikou, for example, sees a primarily pessimistic view of the world, filled with deadly monsters.<sup>716</sup> Clauss, on the other hand, see the poems as an optimistic celebration of human knowledge.<sup>717</sup> Both scholars give careful and thoughtful readings to the same relatively limited corpus of material, using strong textual support for their claims. In truth, Nicander seems to be both a pessimist and an optimist, often at the same time. Tone becomes another arena in which Nicander can exploit the advantages of ambiguity. In this following section, I will consider how Nicander conveys his own view of nature and how scientific poetry is an essential element of that world.

The pessimistic reading of the poem is based on the extremely grim horrors that Nicander recounts in order to heighten the *enargeia* of his poetry and establish the stakes that make his work necessary.<sup>718</sup> The sufferings of victims are explained in excruciating

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<sup>716</sup> Sistikou (2012). This view is also expressed in Toohey (1996), p.70; Spatafora (2005), pp.248-56; Overduin (2014b).

<sup>717</sup> Clauss (2006), esp. pp. 181-82. Sullivan (2013) offers a similar reading.

<sup>718</sup> On *enargeia* in Nicander's poetry, Overduin (2014a), pp.101-02; Sistikou (2012), pp.212-17; Papadopoulou (2009).

detail. In explaining the sequelae of the bite (and the etymology of the name) of the Haemorrois snake, he writes,

At first bite, a sickly dark swelling spreads and a terrible pain congeals around the heart, and the watery belly retches; but on the first night, blood gushes from the nostrils and the throat and through the ears, newly defiled by a bilious poison; and the urine runs out bloody; and wounds break open on the limbs, accelerated by the breakdown of the skin. May the female blood-letter never strike you with her poison! For when she bites, the gums are entirely distended from the root, and untrickling blood flows from the nails, and the teeth fall out, dripping with carnage.

νύχματι δ' ἀρχομένῳ μὲν ἐπιτρέχει ἄχροον οἶδος  
κυάνεον, κραδίην δὲ κακὸν περιτέτροφεν ἄλγος·  
γαστήρ δ' ὕδατόεσσα διέσσυτο, νυκτὶ δὲ πρώτη  
αἷμα διὰ κρινῶν τε καὶ αὐχένος ἠδὲ δι' ὠτων  
πιδύεται χολόεντι νέον πεφορυγμένον ἰῶ,  
οὔρα δὲ φοινίσσοντα παρέδραμεν· αἶ δ' ἐπὶ γυίοις  
ὠτειλαὶ ῥήγγυνται ἐπειγόμεναι χροδὸς ἄτη·  
μήποτε τοι θήλει' αἰμορροῖς ἰὸν ἐνεῖη·  
τῆς γὰρ ὀδαξαμένης τὰ μὲν ἀθρόα πίμπραται οὔλα  
ρίζοθεν, ἐξ ὀνύχων δὲ κατεῖβεται ἀσταγὲς αἷμα,  
οἱ δὲ φόνῳ μυδόμεντες ἀναπλείουσιν ὀδόντες. (*Ther.*298-308)

Nicander seems to take particular delight in explaining what will happen to the victim's body as it loses its integrity, but even when he is less verbose, the risks are always clear:

“But most hateful to men is the scorpion who sports bandy legs that look like fire: it brings immediate death to children.”<sup>719</sup> Sistakou sees in Nicander's vivid depictions of nature a violent interaction between humanity and the environment. She writes that, “far from being a serene, ‘Golden Age’ scenery, Nicander's nature is a danger zone. In terms of low and everyday realism, it represents an actual threat against men of toil, travelers,

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<sup>719</sup> *Ther.* 799-800: “ἔχθιστος δ' ὃ τε ραιβὰ φέρει φλογὶ εἵκελα γυῖα/ ἀνδράσι, νηπιάχοις δὲ παρασχεδὸν ἤγαγεν αἶσαν.”

herdsmen, innocent children...For nature in Nicander is not a place of light but of darkness.”<sup>720</sup>

It is not only human suffering that demonstrates this. In describing the Viper, Nicander offers a mini-Oresteia in the reptile world:

May you never happen upon the dark male viper, when having fled her bite he seethes at the blow of the sooty female, because, when the male mounts her, she cuts off the head of her mate, passionately scratching with a furious fang. But immediately the little vipers while being born pursue the outrage of their father, since by eating through the thin stomach of their mother, they are born motherless.

μη σύ γ' ἐνὶ τριόδοισι τύχοις ὅτε δάγμα πεφυζῶς  
περκνὸς ἔχις θυίησι τυπῆ ψολόεντος ἐχίδνης,  
ήνικα θορνυμένου ἔχιος θολερῶ κυνόδοντι  
θουράς ἀμύξ ἐμφῶσα κάρην ἀπέκοπεν ὀμεύνου·  
οἱ δὲ πατρὸς λώβην μετεκίαθον αὐτίκα τυτθοί  
γαινόμενοι ἐχιῆς, ἐπεὶ διὰ μητρὸς ἀραιήν  
γαστέρ' ἀναβρώσαντες ἀμήτορες ἐξεγένοντο· (*Ther.*128-34)

In Nicander's world, nature is, to quote Tennyson, “red in tooth and claw.”<sup>721</sup> The poet seems to relish his opportunities to describe the most grim and disgusting things that can happen in the wild.

These violent and dark pictures of nature are all the more striking because they are set in a world that owes a significant debt to Theocritus' bucolic *locus amoenus*.<sup>722</sup> The poems are populated with herdsman and set exclusively in the countryside. But Nicander highlights the dangers these Theocritean figures face, such as when he explains why not to sleep outdoors, as the characters in bucolic poetry are wont to do.<sup>723</sup> The

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<sup>720</sup> Sistikou (2012), p.208.

<sup>721</sup> Tennyson, “In Memoriam A.H.H.,” 56.15.

<sup>722</sup> See Overduin (2014a), 106; Overduin (2014b).

<sup>723</sup> *Ther.*21-27.

contrast is most directly expressed when Nicander describes an unidentified animal called the Cenchrines:

ἦτοι ὄτ' ἠελίοιο θερειτάτη ἴσταται ἀκτίς,  
οὔρεα μαιμώσσων ἐπινίσσεται ὀκρίοντα  
αἵματος ἰσχανόνων καὶ ἐπὶ κτίλα μῆλα δοκεύων,  
ἦ Σάου ἠὲ Μοσύχλου ὄτ' ἀμφ' ἐλάτησι μακεδναῖς  
ἄγραυλοι ψύχωσι, λελοιπότες ἔργα νομήων.

When the rays of the sun stand hottest, eagerly [the Cenchrines] goes to the rough mountains, desiring blood and looking for tame sheep, when herdsman cool down by the tall firs of Saüs or Moschylus, having ceased from the work of shepherds. (*Ther.*469-73).

The Theocritean bucolic paradise has been upended and is now filled with deadly monsters.

With the exception of mythological aitiologies, humans appear in the poems only as victims, often specifically marked by their profession: herdsman, farmers, and even fishermen.<sup>724</sup> Daily life for these people demands constant interaction with the brutal and bloody world. Moreover, Nicander's nature is not passively heartless, but actively cruel. The poet frequently anthropomorphizes the venomous animals to suggest that they have actual malice towards humans; even the millipedes plot against us.<sup>725</sup> Sistikou's pessimistic reading of Nicander emerges from this: daily necessity requires humans to be constantly at war with animals that want to and can kill us.

But Clauss sees the *Theriaca* as a fundamentally optimistic poem.<sup>726</sup> It is not just a litany of deadly creatures and the symptoms of their bites, but roughly half the poem

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<sup>724</sup> See Overduin (2014a), pp. 105-06; Jacques (2002), pp. lxxxiv-lxxxvi.

<sup>725</sup> *Ther.*811 For a lengthier discussion of this phenomenon in the poem, see Overduin (2014a), p. 98-101; Jacques (2002), pp. lxxxii-lxxxiv.

<sup>726</sup> Overduin (2014a), p. 114.

details how to avoid those animals and treat their bites. Clauss focuses on how repeatedly Nicander mentions the ease with which you can remedy snakebites, including the already discussed prominent use of the word ‘ῥεῖα’ in the proems of both the *Theriaca* and the *Alexipharmaca*, as evidence of Nicander’s optimism.<sup>727</sup> Clauss suggests that the *Theriaca* offer “striking tension between the sensational descriptions of suffering that the Titanic spawn can cause and the poet’s effusive confidence and decided ease in warding off death.”<sup>728</sup> Clauss may overstate the case a bit, but humans are hardly defenseless in the battle against venomous creatures, and Nicander stresses this repeatedly.

These opposing readings of the poem are the product of the sharply contrasting pictures of nature that Nicander offers. Nature itself is portrayed in a epic style in which venomous animals are described much like mythological beasts, and battles wage between different species, such as the between the Asp and the Ichneumon, or between the eagle and the Drakon.<sup>729</sup> Human life seems much tamer, but not all interactions with animals and plants are harmful. Most human interactions in the poems occur within the context of domestication of animals and plants: farmers, herdsmen, and even Alcibius the hunter is attended by his dog.<sup>730</sup> Humans have some measure of control over the environment and can harness it for their benefit.

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<sup>727</sup> *Ther.* 1; *Alex.* 4. Clauss (2006), pp. 162-64; 179-80. Nicander is boastful throughout the poem and on all subjects, referring to himself as Homeric in the sphragis, see Magnelli (2010), pp. 216-17, and especially Gow and Schofield (1953), p. 189, who remark that the boast is “not inappropriate to a self-satisfied poet writing hexameters with an archaic vocabulary.”

<sup>728</sup> Clauss (2006), p. 182.

<sup>729</sup> *Ther.* 190-208; 448-57. See Overduin (2014a), pp. 125-27.

<sup>730</sup> *Ther.* 666-75.

But in his description of non-domesticated plants and animals, Nicander often depicts humans as interlopers. As Overduin points out, “Nicander has chosen to make the natural world the focus of his descriptions. The result is a poem in which human beings appear as intruders rather than protagonists.”<sup>731</sup> Most references to humans, as stated above, are specifically keyed to their profession, and also to their role as victims, even the ploughman, herdsman, and woodcutter named in the proem of the *Theriaca*.

The second venomous animal catalog in the *Theriaca*, as discussed in section 3, begins with two lines that open with Nicander’s two main poetic models, Hesiod and Aratus: “Ἔργα δέ τοι σίνταο περιφράζοιο φάλαγγος/ σήματά τ’ ἐν βρυχμοῖσιν.”<sup>732</sup> On the whole, it is possible to map the pessimistic and optimistic aspects of his worldview onto these terms. Human labor necessitates the struggle with nature, and our knowledge of the signs within it helps us to survive. Scientific knowledge is the ultimate weapon in our fight to survive against the natural world.

It is not just knowledge, however, that is necessary for human existence in this world, but scientific poetry. In the proem of the *Alexipharmaca*, Nicander explains his ability to instruct his addressee, Protagoras:

Even though the peoples from whom we received our births did not establish in Asia neighboring walls for their towers, Protagoras, but a long space keeps us apart, still easily (ῥεῖα) I could tell (αὐδήσαιμ’) you the remedies to poisonous drinks which, when they attack (ἐνιχριμφθέντα), conquer (δαμάζει) mortals. For you dwell near the tempestuous sea under navel-like Arctus, where are the caves of Locrinian Rhea and the secret rites of Attes. But I live where the children of famous Creusa divided up the fattest portion of the land, settling by the tripods of the Far-darter of Clarus (τριπόδεσσι πάρα Κλαρίοις Ἐκάτοιο).

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<sup>731</sup> Overduin (2014a), p. 101.

<sup>732</sup> *Ther.* 715-16.

Εἰ καὶ μὴ σύγκληρα κατ' Ἀσίδα τείχεα δῆμοι  
τύρσεσιν ἐστήσαντο τέων ἀνεδέγμεθα βλάστας,  
Πρωταγόρη, δολιχὸς δὲ διάπροθι χῶρος ἐέργει,  
ῥεῖά κέ τοι ποσίεσσιν ἀλέξια φαρμακοέσσαις  
αὐδήσαιμ' ἅ τε φῶτας ἐνιχρिमφθέντα δαμάζει.  
ἦ γὰρ δὴ σὺ μὲν ἄγχι πολυστροίβοιο θαλάσσης  
Ἄρκτον ὑπ' ὀμφαλόεσσαν ἐνάσσαο ἦχί τε Ῥεῖης  
Λοβρίνης θαλάμαι τε καὶ ὄργαστήριον Ἄττεω·  
αὐτὰρ ἐγὼ τόθι παῖδες εὐζήλοιο Κρεούσης  
πιοτάτην ἐδάσαντο γεωμορίην ἠπείρου  
ἐζόμενοι τριπόδεσσι πάρα Κλαρίοις Ἑκάτοιο. (*Alex.*1-11)

This is the remarkably short introduction to the poem, but it captures *in nuce* the main themes of Nicander's poetry. The plants are given agency in their attacks on humans, Nicander's confidence in his own abilities is on full display, and human mastery over the land (if not the sea) is assumed. But the abilities he boasts are directly tied to his lengthy description of his hometown, and its connection to Apollo, here specifically mentioned in his capacity as healer and bringer of disease. Nicander's authority comes from his special relationship with the god both of healing and of poetry. Moreover, the verb he uses to describe his own utterances, "αὐδάω," has oracular connotations as well.<sup>733</sup> Nicander's references to his connection to Clarus and the god Apollo here at the beginning of the *Alexipharmaca* and in the sphragis of the *Theriaca* underscore the role of scientific poetry in the natural world he depicts. It is the salvation made necessary by the horrific natural world we interact with and made easy by Nicander's relationship to the god Apollo. To adjust Clauss' reading of the *Theriaca* only slightly, we can see Nicander celebrating not merely human wisdom, but specifically the role of poetry in communicating that knowledge, even over vast distances.

<sup>733</sup> *Alex.*5. LSJ.s.v.I.3. See, for example. Soph.*OT.*392.



## VI. Conclusion: Poetic Mortality

In discussions of Hellenistic poetry, Nicander is sometimes held up as an example of the more mainstream Hellenistic approach to didactic poetry than Aratus' *Phaenomena*.<sup>734</sup>

Certainly, there are attested a number of poems on flora and fauna to suggest that biological diversity offered an attractive topic for poets of the time. But this reading also assumes that Nicander's works are intended for the exact same purposes as Aratus' and it is only the level of skill that separates their pedagogical success. Nicander does not achieve what Aratus does, but we cannot assume that this was his goal, either.

Instead, the themes of his poetry suggest that Nicander's greatest interest is his own legacy. In his use of signs, his organization of his material, and his linguistic choices, Nicander repeatedly takes his precedent from third century BCE poets, especially Aratus, but also Callimachus and Theocritus. But instead of replicating their works, he often subverts them in the service of innovation, a difficult task for a poet looking back on a century of literary experimentation. His innovations typically generate, intentionally or not, a sense of ambiguity in his poetry. Is Nicander an optimist or a pessimist? Is the Hydrus the same snake as the Dryinas, or a different one? Is the stinger of a scorpion violet-colored, or poison-colored? This ambiguity is also evident in his use of earlier prose texts about biology and toxicology, in which Nicander prefers to offer a multiplicity of options rather than to settle decisively on one. Where Aratus see signs in the universe as inerrant markers that can be used confidently to predict the future, Nicander highlights the messiness and uncertainty of the natural world. Even the

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<sup>734</sup> Gutzwiller (2007), p. 104.

abundance of medicinal plants that he offers suggest a means of increasing the odds that at least some of them will work. Names are in general a stabilizing force, a way of delineating species (by the signs on the snake) and means of countering the mortality that human life inevitably faces. Death and obscurity are ever present dangers to the poet who works on snakes in a belated world filled with famous poets. Survival can only be achieved, in both instances, through the accomplishment of scientific poetry.

## CONCLUSION

In the introduction to this dissertation, I stated that I did not wish to force a narrative onto the poems under discussion, and instead would address them in chronological order. Some progress can be seen through the texts, nevertheless. The similarities between Aratus' and Nicander's poetry are more apparent, but Aratus and Apollonius are operating within the same environment of high levels of experimentation and contact between figures working on many different subjects. In contrast, Nicander looks back to the previous century and attempts to fit himself into a discussion that has already ended. Apollonius and Nicander have a few things in common, such as their use of prose sources and medical information, but Nicander's decision to link himself to the *Phaenomena* shows that already in the 2<sup>nd</sup> century BCE, the didactic genre is becoming the primary mode for composing scientific poetry. In the Roman period, science becomes a common subject for didactic poetry, and this may be attributed, at least in part, to Aratus' success, and to Nicander's decision to follow Aratus' lead. Aratus and Apollonius reflect the diversity and experimentation of the early Hellenistic period, whereas Nicander represents the move towards increasing canonization of the connection between scientific subjects and didactic poetry. Furthermore, despite Nicander's Aratean focus, there are connections between all three of these authors. In the following, I will summarize the primary similarities between these poets that have emerged from this study, as well as the ways in which they differ.

## **I. Archaic Authority**

These poets are most clearly linked together by their relationship to archaic poetry.

Although Aratus and Nicander adopt a Hesiodic structure for their work and Apollonius uses a Homeric one, all three are linking themselves, in a broader sense, to the epic tradition. This can be seen in Aratus' and Apollonius' use of formulaic language from the Homeric hymns, and Nicander's citation of both Hesiod and Homer as important inspirations for himself. Their interest in archaic poetry therefore extends beyond finding a specific model for their own poem, and instead becomes a way of thinking about the authority of poetry, especially the Ur-poets, Homer and Hesiod. The authority of archaic epic is not absolute, however. Apollonius must argue for the authority of Homer as a geographer, in the face of criticisms from Eratosthenes. Aratus may present himself as a modern Hesiod, but this is in his guise as an instructor, not an astronomer. Nicander openly questions whether Hesiod spoke the truth at the beginning of his poem, and, at the end, dares to name himself equal to Homer. Aratus represents a changing awareness of the information within these texts, and Apollonius offers an argument that would not have been necessary if Homer were universally considered the source of all knowledge. Nicander proves that by the second century BCE, these epic poets were not quite the same authority figures as they had been a few centuries earlier.

## II. Prose and Poetry

All three of these poets have a specific relationship with a prose text, or more than one, and this relationship reflects the primary concerns for each. Aratus follows Eudoxus' astronomical treatises carefully, but where he diverges from them, the central themes of the poem emerge. Aratus alters Eudoxus' organization of the material, and he shows a much greater interest in the brightness and visibility of stars than Eudoxus does, which also reflects his focus on the experience of seeing and interpreting signs, in which their level of accessibility is an important factor. For Aratus, the prose text is a source of information, and a place of departure for his poetry.

Although the *Argonautica* probably uses some information from geographers and historians such as Timosthenes and Timagetus, there is no one text from which Apollonius derives his model of the voyage and the shape of the *oikoumene*. Instead, the prose text of greatest importance for the *Argonautica* is the *Geographika* by Eratosthenes. This work represents the opposing side of the debate in which Apollonius offers his claim that Homeric geography is coherent and can be used to map the Mediterranean region. Poetry and prose are, for Apollonius, competing sources of knowledge, in dialog with one another.

Nicander, like Apollonius, has no single prose source behind his poetry, despite modern attempts to find one. Instead, Nicander draws from a wide range of sources to construct his own treatises on toxicology. Theophrastus and Apollodorus had already

written on the subject, but it was still a relatively new discipline, and Nicander helps to legitimize it as an important topic by linking himself to a tradition of scientific poetry, represented by Aratus' *Phaenomena*, rather than to earlier toxicological prose works. Poetry, for Nicander, can legitimize a discipline in a way that prose texts cannot.

The existence of prose sources behind these poems is frequently cited in order, implicitly or explicitly, to diminish their scientific value. The evidence for these claims is quite mixed, but even when reliance of a poet on a prose author is certain, as with Aratus and Eudoxus, there is still much more within the poem than a mere recapitulation of the prose text in hexameters. Apollonius and Nicander both collate and interweave different sources of information, possibly including empirical observation. But they use their methodology to different purposes: Apollonius offers a treatise on Homeric geography, one specific problem within the broader field, whereas Nicander seeks to offer a comprehensive account of poisons and their remedies.

### **III. Organization**

The collating and interweaving aspect of Apollonius' and Nicander's work also sheds light on the importance of organization within their poetry. This seems to be a widespread concern throughout almost all writing in the Hellenistic period, but in each of these works, the organization of the text also helps to clarify their understanding of the material within it. This is most straightforward in Apollonius, who has a series of discrete episodes tying Argonauts to specific places around the Mediterranean. In order for the narrative to cohere, Apollonius must arrange them in the order of the voyage, and

in the process, offer a map of the *oikoumene*. In the *Phaenomena*, as discussed above, Aratus uses his organization to highlight patterns. Moreover, in his descriptions of the constellations and the *paranatellonta*, Aratus links constellations to each other in his catalog, creating a chain so that each entry in the list is a sign, leading you to the next constellation. Nicander explores the various possibilities of arranging material, grouping poisons with individual remedies in the *Alexipharmaca* and treating each separately in the *Theriaca*. The division of the *Theriaca* reflects a taxonomy that separates snakes and insects and their respective remedies. But Nicander is not satisfied to mirror the biological organization in earlier biological works, in which the differences between species are the defining criteria. He stresses the similarities, instead, blurring the lines between different kinds of snakes, and between plants that look the same, creating a taxonomic ambiguity. The way each poet arranges the information in his work reflects his central concerns: patterns and signs, correspondence between narrative and reality, and the ambiguity of the biological world. Organization seems like a passive activity, but it is a way of interpreting information, as Crombie showed by including it in his list of different styles of scientific thinking. It is widespread in the Hellenistic period, but these texts help to show the way that it can be a useful way of thinking about the interconnections in a large body of information.

#### **IV. Signs**

Although we can see similarities in the way each of these poets addresses the authority of archaic poetry, the use of prose sources, and the organization of their material, the true connective thread between these authors is the role of signs. This is an Aratean

development, and his entire poem explores and celebrates human use of signs. For Apollonius and Nicander, signs are a way to connect their work to Aratus. Aratus' signs are certain, and it is only the experience of the observer that introduces an fallibility. Apollonius' signs are also secure, but they stand as evidence not for practical purposes, such as when a storm is coming, but rather for the stories of the past and their impact on the landscape. Nicander distorts the Aratean trope and strips his signs of their infallibility, as similarities between different types of poison and venom produce similar symptoms and biological life forms resemble one another. Signs become another source of ambiguity in Nicander's world, a world in which scientific poetry represents the only hope of survival.

The signs in these poems are an important part of what makes them scientific. They offer proof of the veracity of the poet's words that is grounded in empirical observation. But the *σήματα* in these poems also mark them as poetry. "Sign" in Greek can be rendered as *σήμα* or *σημεῖον*, depending on whether it is a work of prose or of verse. *σήμα* occurs almost exclusively in poetry, and in prose works only to mean a burial mound.<sup>735</sup> Conversely, *σημεῖον* means exactly the same thing, but is almost exclusively used in prose, and does not occur in the works of Hesiod or Homer.<sup>736</sup> The *σήμα* is therefore the perfect encapsulation of these poems: scientific and poetic, both, at the same time.

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<sup>735</sup> LSJ s.v. *σήμα*, especially A.3.

<sup>736</sup> LSJ s.v. *σημεῖον*."



Science in the Hellenistic period was practiced in a variety of ways. The difficulty that scholars have defining the term relates to the multiple Greek words that sometimes (but not always) mean something resembling our understanding of science. The ‘scientific method’ was not a canonized practice, and some practitioners focused entirely on abstract concepts, like Archimedes, or empirical data, like Hipparchus. The collection and analysis of previous texts played an important role, such as in the synthetic mathematical works of Euclid or Eratosthenes’ *Geographika*. In this context, we should not immediately discount poetry as another means of communication scientific ideas. Aratus, Apollonius, and Nicander do not have to be *scientists* for their work to be *scientific*. The running motif of signs in their works show the emphasis on empirical observation as proof of their serious intent in discussing natural phenomena.

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