

Science and Poetry in Imperial Rome: Manilius, Lucan, and the *Aetna*

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ABSTRACT

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This dissertation examines the relationship between scientific inquiry and hexameter poetry at Rome in the first century CE. It focuses on three poetic texts: Manilius' *Astronomica*, Lucan's *Civil War*, and the anonymous *Aetna*. It argues that despite generic and thematic differences, these works participate in a common dialogue and therefore can benefit from being read side by side. In particular, the dissertation demonstrates that all three authors reflect on the ability of poetry to communicate scientific knowledge, and that they simultaneously question or undermine the practical value of that knowledge. As a result, it allows us to see that scientific inquiry itself constitutes a dynamic and multifaceted area of creative literary activity in Early Imperial Rome.

Table of Contents

Acknowledgements	iii
1. Introduction	1
1.1 Structure and Contents	4
1.2 The Argument and its Context	8
2. Manilius and the Mathematics of the <i>mundus</i>	22
2.1 Mathematics and the Greco-Roman Literary Tradition	26
2.2 Complexity, Order, and Mathematical Knowledge	43
2.3 Addition, Enumeration, and the Supremacy of Mathematical Astrology	67
3. Science and Poetry in the <i>Aetna</i>	87
3.1 The Rejection of the Literary Tradition	89
3.2 Scientific Inquiry and the Marvelous Mountain	100
3.3 Reinventing the Aetna Topos	116
4. Lucan and the Limits of Didactic Poetry	133
4.1 The Reliability and Relevance of the Didactic Tradition	135
4.2 Cato and the Libyan Snakes	153
4.3 Acoreus and the Nile	178

Conclusion	204
Bibliography	213

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Chapter 1: Introduction

This dissertation examines the relationship between scientific inquiry and hexameter poetry at Rome in the first century CE. It concentrates on three poetic texts: Manilius' *Astronomica*, the anonymous *Aetna*, and Lucan's *Civil War*. It is my contention that despite generic and thematic differences, these works participate in a common intellectual dialogue and therefore can benefit from being read side by side. In this introduction, I will outline the arguments of the following chapters and then examine two basic problems with which all of these texts are concerned. As we will see, all three authors reflect on the suitability of poetry as a medium for communicating scientific knowledge and simultaneously call into question the value and practical benefits of that knowledge. Instead of considering the texts in chronological order, we will follow a narrative of increasing skepticism and trace the various ways in which these authors undermine the traditional motivations for, and even the very desirability of, explaining the natural world from a scientific perspective.

At the same time, this project attempts to contribute to a growing interest in several areas of classical scholarship that have traditionally tended to receive less prominent critical consideration. Although Lucan's poem has been the subject of a great deal of recent criticism, and a reevaluation of so-called Silver Latin Poetry has been under way for some time, modern scholarship has paid comparatively little attention to the *Astronomica* and the *Aetna*, and no previous study has brought all three texts together. Similarly, despite widespread scholarly interest in Greco-Roman didactic poetry, discussions of Latin didactic tend to focus on Lucretius, Virgil, and Ovid. The permutations and reformulations to which post-Ovidian authors, such as Manilius and the *Aetna* poet, subject the genre have not received sufficient analysis, and Lucan's

engagement with the tradition has gone virtually unnoticed.¹ There is also a need for further examination of both Latin scientific writing and the treatment of scientific themes in verse. Historians of science routinely privilege Greek authors over their Roman counterparts and prose authors over their poetic rivals.² This may seem natural enough. We possess a vast quantity of Greek scientific prose texts, the few poetic compositions that remain are generally considered to constitute mere verse adaptations of earlier prose treatises, and Rome rarely produced the kinds of highly original thinkers whom later scientists and historians of science turned into their own intellectual heroes and forebears. To put the matter simply, there appears to be no Roman Euclid, no Roman Ptolemy, no Roman Galen. Within a Roman context, Lucretius, Vitruvius, Seneca, and Pliny constitute the main exceptions to this trend, and their writings have seen a considerable renewal of interest in recent years.³ I wish to complement this renewal of interest and to add to the growing body of scholarship that takes seriously the literary value and intellectual subtlety of Silver Latin Poetry and post-Ovidian didactic. For the most part, however, I am not interested in the accuracy, origins, or immediate sources of the scientific

¹ Comprehensive introductions to ancient didactic, such as Effe 1977 and Toohey 2006, do include later authors; cf. Schindler 2005 on Latin didactic as a whole. Notably, Schindler 2000 and Volk 2002 include Manilius in sustained analyses of Latin didactic. Volk 2005a treats the *Aetna* from this generic perspective, and Lausberg 1990 does the same for Lucan, albeit on a rather limited scale.

² Some recent historians of science have devoted a good deal of substantive analysis to Roman prose and verse texts. Cuomo 2001, for example, offers a particularly subtle and insightful approach to ancient mathematics, both Greek and Latin. Similarly, Netz 2009 displays a unique sensitivity in his analyses of mathematical themes in Greek and Latin poetic texts.

³ Although Lucretius has long been popular, more recent works open up a variety of exciting perspectives; see, e.g., Gale 1994, Kennedy 2002, and Hardie 2009. Other recent stimulating studies of these authors include Beagon 1992, Inwood 2002, Murphy 2004, Hine 2006, and Williams 2012, which reworks and expands several earlier publications on Seneca's *NQ*. Schama 1995 constitutes a particularly impressive study that offers keen readings of Vitruvius, Seneca, and Pliny within a vast historical and interdisciplinary framework.

theories that appear in the works under consideration. A variety of scholarly publications is available to explicate the theories themselves, and recent editors and commentators provide ample discussion.⁴ The derivative nature of much Roman technical writing is also well known, and there is little to be added to the results of more traditional forms of source criticism.⁵ Instead of creating genealogies or hunting for sources, I want to examine the ways in which scientific discourse itself functions as a key area of creative literary activity in the first century CE. By considering how Manilius, Lucan, and the *Aetna* poet probe the competing claims of different scientific traditions and actively negotiate the boundaries between science and poetry, this dissertation allows us to see that the literary exploration of different scientific fields makes a unique contribution to the intellectual history of the Early Empire.

Before we begin, a word needs to be said about terminology. Recent historians of science have repeatedly emphasized that employing such terms as “science”, “scientist”, and “scientific” in ancient contexts constitutes a gross anachronism. The methods, goals, and fundamental assumptions of the modern sciences differ radically from those of any ancient intellectual pursuits, and any attempt to apply modern intellectual categories to Greco-Roman activities runs the risk of seriously misrepresenting the past.⁶ This is not the place to formulate a new vocabulary or approach, and despite the potential danger, I have decided to use these terms.

⁴ For Manilius, see Goold 1992, Feraboli, Flores, and Scarcia 1996-2001, and Volk 2009; Housman 1903-30 is still fundamental. For the *Aetna*, see Goodyear 1965, Paisley and Oldroyd 1979, Iodice 2002, and Volk 2005a. For the relevant portions of Lucan, see Lausberg 1990, Berti 2000, Raschle 2001, and Wick 2004.

⁵ For source criticism, see the works cited in the previous note, as well as Goodyear 1984, De Vivo 1989, and Bianchetti 1998 on the *Aetna*. It is particularly difficult to determine any of Manilius’ sources since the *Astronomica* is the earliest astrological text to have survived from Greco-Roman antiquity; accordingly, source-critical studies are highly conjectural.

⁶ French 1994: ix-xxii and Rhill 1999: 1-23 provide useful discussions.

It should be noted, however, that I do not mean to impute modern intellectual values to the writers under consideration. The Greeks and Romans had their own ways of conceptualizing what we now call ancient science. At the most general level, these activities belonged to the pursuit of *philosophia*. Within *philosophia* itself, ancient writers distinguished a number of subcategories, and five of those subcategories figure prominently in the following pages: astrology and astronomy, cosmology, mathematics, meteorology, and natural history.⁷ I use the terms “science”, “scientist”, and “scientific” as convenient shorthand to refer simply to these subcategories of *philosophia*, and to those individuals who engaged in or wrote about them. No broader assumptions or value judgments are implied, and the analyses themselves will suggest just how far these activities differ from their modern scientific counterparts.

1. Structure and Contents

I have already stated that the dissertation’s organizing principle is not chronological. As the narrative progresses, we move from optimism to pessimism and from positivism to skepticism or doubt. Below I summarize the basic arguments and claims of the individual chapters.⁸

⁷ I also use the phrase “natural philosophy”, or “natural philosophical”, in the sense of “speculation about the ultimate principles and constituents of the natural world” (French 1994: x); this constituted a recognizable pursuit in antiquity and, to a certain degree, overlaps with cosmology. Note, too, that ancient writers regularly view astronomy and astrology as two closely related disciplines, even as two sides of the same coin (e.g., Ptolemy *Synt.* 1.1). Evans 1998 provides a lucid account of ancient astronomy as we conceive of it. Barton 1994 and Beck 2007 give helpful introductions to astrology and stress its close connection with astronomy.

⁸ Throughout the dissertation, I use “Manilius”, “the *Aetna* poet”, and “Lucan” as convenient shorthand to refer to the poetic personae of the authors of the *Astronomica* and *Aetna*, and to the anonymous narrator of the *Bellum Civile*, respectively. I make no claims as to what the historical individuals actually thought, believed, knew, etc.

Chapter 2 considers Manilius' *Astronomica*. Through five books of hexameter verse Manilius gives his audience a tour of the heavens during which he tirelessly expounds the principles of astrology and catalogues the configurations of the zodiac. As a part of this tour, Manilius teaches the reader to perform a variety of mathematical operations that belong primarily to the ancient fields of logistic, geodesy, and astronomy. I examine the programmatic value that these mathematical tasks assume, and consider the ways in which the astrologer creates meaning out of numbers. This allows three basic points to emerge. First, Manilius defines his scientific persona through his own mathematical expertise. By repeatedly highlighting the mathematical nature of the universe and parading his ability to perform complex mathematical operations, he makes mathematical dexterity the defining characteristic of the astrologer and defines astrology itself as a fundamentally mathematical enterprise. Second, poetry constitutes the ideal medium for explaining the natural world. The numbers and measurements (*numeri* and *modi*) with which the poet analyzes the heavens cannot be distinguished from the rhythms and meters (*numeri* and *modi*) through which he composes verse. There is an inherent connection between poetic form and the structure of the universe that makes poetry an indispensable tool for understanding the world. Third, only mathematical astrological poetry can provide accurate information about the cosmos. Manilius implicitly equates the reason (*ratio*) that governs the cosmos, and that astrology itself explores and explains, with the mathematical calculations (*rationes*) upon which his version of astrology relies and in which his own persona is based. This stance allows the poet to characterize other areas of scientific inquiry, such as we encounter in subsequent chapters of this dissertation, as unreliable or unimportant. At the same time, as the work progresses, Manilius' mathematical knowledge becomes increasingly abstract and divorced from any kind of practical application. Despite the

ostensible goal of teaching the reader to cast a horoscope, the astrologer embraces the image of an abstract mathematician who sings his song to the stars, rather than to any human audience, and so celebrates a kind of pure or entirely cerebral science.

Chapter 3 turns to the *Aetna*, an anonymous poem that moves the reader underground in an attempt to understand the hidden causes of Mt. Aetna's volcanic activity. Whether as home to the Cyclopes or as the site of Hephaestus' workshop, Aetna has a long literary history. Pindar provides the first extant account of one of the mountain's fantastic eruptions. Later poets repeatedly describe the fiery lava flows and thunderous explosions that issue from the mountain and seek to understand such phenomena in mythological terms. Accordingly, I argue that we need to approach the text of the *Aetna* by considering how the poet negotiates the mountain's literariness from a scientific perspective. On the one hand, the poet rejects the literary tradition regarding Aetna. He calls for scientific investigation into natural phenomena, sets out an integrated theory of the nature of volcanic activity, and formulates a theory of scientific inquiry that is grounded in the pleasure of learning and completely divorced from any kind of practical application. At the same time, although the mountain constitutes a spectacular marvel, it closely resembles a variety of technical contraptions that figured prominently in actual imperial spectacles. The mountain becomes a showpiece of mechanical engineering, a source of entertainment that the reader can watch quite safely. On the other hand, the poet continually reinvests the mountain with mythological significance and situates his own scientific discourse within a poetic universe. The growing frequency and intensity with which the poet depicts the mountain's eruptions and the variety of literary traditions with which these eruptions are associated disturb and distract the reader, simultaneously encouraging him to conceive of the mountain as a literary artifact. The poem's conclusion takes this maneuver further. There, the

poet endows both the mountain and the natural world with moral purpose and direction, once again undermining the intellectual principles upon which the work's scientific analyses rest. Although scientific inquiry correctly explains the nature of the mountain, both literary tradition and moral philosophy counterbalance the authority of scientific inquiry and provide complementary perspectives for understanding the natural world.

Chapter 4 examines the representation of scientific knowledge and poetry in Lucan's *Bellum Civile*, bringing the reader back to the surface of the earth, where he encounters a wide variety of environments and natural phenomena. Throughout the poem, Lucan displays a high level of scientific sophistication. The poet discards the mythological narratives through which epic poetry traditionally talks about natural phenomena, and repeatedly explains the natural world with and through the tools of scientific inquiry. I argue, however, that Lucan presents both scientific learning and scientific poetry as completely ineffectual and entirely unable to be put to practical uses. Scientific poetry, in particular, constitutes an alternative to Lucan's brand of epic, and it is an alternative that Lucan firmly rejects. The bulk of my discussion focuses on two episodes from Books 9 and 10. On the one hand, Book 9 gently mocks the scientific learning and the literary tradition of scientific poetry. During an excruciating march across the Libyan desert, Cato's Roman army arrives at a spring that teems with poisonous snakes. Lucan now adopts the role of a didactic poet and teaches the reader about the snakes, drawing heavily on a tradition of scientific poems about poisonous animals. The troops, however, fail to perceive the nature of the situation, and the snakes soon decimate Cato's army. Natural historical and medical knowledge fail to assist the snakes' victims as well, and we are left with the impression that both science and scientific poetry have no meaningful or practical role to play in Lucan's universe. On the other hand, Book 10 portrays the dangerous powers of scientific poetry. While

in Alexandria, Caesar wishes to learn the source of the Nile and why it floods during the summer. Although ancient scientists were notoriously unable to answer these questions, Caesar allows himself to be seduced by a priest-poet who appears to solve the mystery. While Caesar listens in rapt attention to this priest-poet's distortions and half-truths, his enemies hatch a deadly plot. This paradoxical song about two unanswerable questions represents the treacherous allure of a didactic poem that says nothing and goes nowhere, leaving the listener in a dangerous state of idleness and delusion. Although Lucan tacitly acknowledges the need to explain the natural world from a scientific perspective, his narratives repeatedly imply that poetry and scientific exposition are at best unable to provide practical benefits, at worst subversive, misleading, and potentially aggressive.

The dissertation ends with a short conclusion. It reviews and contrasts the basic positions of the individual authors and emphasizes the overarching sense of dialogue that unites them. It then briefly considers some of the limitations of the dissertation and several questions that the dissertation raises, but that fall outside its actual scope.

2. The Argument and its Context

As this outline has begun to suggest, the three authors under consideration share certain concerns and attitudes. As the narrative progresses, we (i) encounter more and more skepticism towards the very idea that poetry can or even should communicate scientific knowledge. Similarly, (ii) each new chapter presents an increasingly negative assessment of the reliability and practical value of scientific learning. Below, I discuss the background for both points and then focus on two earlier texts that provide particularly instructive parallels for Manilius, Lucan, and the *Aetna*

poet. The issues that I raise have received considerable scholarly attention elsewhere, and I do not attempt to make any new contributions to the topics or debates under consideration. Rather, I wish briefly to locate the broader arguments of the dissertation within their proper intellectual and literary contexts.

The idea that poetry constitutes an appropriate medium for conveying scientific knowledge has a long and complicated history in the Greco-Roman world, and we can touch on it here only briefly. Hesiod's *Works and Days* covers a variety of celestial and atmospheric phenomena,⁹ and Presocratic philosophers such as Empedocles and Parmenides analyze the cosmos in verse. At a later date, numerous intellectuals also claim to find profound scientific learning in the Homeric poems. Heraclitus' *Homeric Problems* and the anonymous *On Homer* attributed to Plutarch offer allegorizing interpretations of the *Iliad* and *Odyssey* that ostensibly reveal Homer's familiarity with cosmology, astronomy, meteorology, and many other areas of learning.¹⁰ A writer such as Strabo can even locate deep geographical knowledge in Homer and polemicize vociferously against those who deny such wisdom to the poet.¹¹ In the Hellenistic period, sophisticated scientific learning and erudite allusive poetry often work together.¹² Although scientific theory occasionally surfaces in an author like Callimachus,¹³ there are a

⁹ Hesiod's *Astronomia* (fr. 288-93 M-W) probably treated the stars in a similar way.

¹⁰ Hillgruber 1994: 1.5-35 provides an in depth account of ancient attitudes towards Homer's supposedly wide ranging knowledge.

¹¹ Aujac 1966: 19-36 treats Strabo's conception of Homer.

¹² See, for instance, the papers collected in Harder, Regtuit, and Wakker 2009. Cf. Netz 2009, who examines the relationship between Hellenistic literary aesthetics and Hellenistic mathematics.

¹³ Two classic examples are Callimachus' use of the medical theories of Herophilus in the *Hymn to Artemis* and *Hymn to Delos*; see Opperman 1925 and Most 1981, respectively.

number of extant works that are entirely devoted to different scientific fields. Aratus' *Phaenomena* and Nicander's *Theriaca* constitute two particularly conspicuous examples of this tradition, and figures such as Archimedes and Eratosthenes compose poems that make epideictic displays of their mathematical expertise.¹⁴ Poetry's status as an appropriate means for communicating scientific theory has a parallel history at Rome. Ennius' *Epicharmus* (*varia* 45-59 Vahlen²), for example, treated the origins of the universe, the soul, and the four elements, and the opening of the *Annales*, which proved widely influential, famously contained natural philosophical and/or Pythagorean themes and imagery.¹⁵ In addition to Lucretius, whom we will consider below, Egnatius wrote a *De rerum natura*, and this poem, as far as we can tell from its fragmentary state, appears to have explained some sort of volcanic activity and to have dealt with the moon (fr. 1-2 Courtney = 43-43a Hollis). It is also well known that Aratus' poem enjoyed considerable popularity in the Roman world. Cicero, Ovid (fr. 1-2 Courtney), and Germanicus all translate or adapt the *Phaenomena* into Latin,¹⁶ and numerous other authors, such as Virgil, engage with Aratus extensively.¹⁷ For whatever reason, it seems that such scientific verse possessed an extraordinary appeal—as Ovid puts it, “along with the sun and the moon, Aratus will always exist” (*cum sole et luna semper Aratus erit*, *Am.* 1.15.16). The Roman interest in

¹⁴ Archimedes and Eratosthenes are discussed below in Chapter 2.1.

¹⁵ For the *Annales*, see Hardie 1986: 76-83. Although Lucilius may have discussed the nature of storms (fr. 1308 Marx), the significance of the line and its original context are both highly uncertain.

¹⁶ Varro Atacinus (fr. 13-4 Courtney = 120-1 Hollis) adapted at least the so-called *Diosemeiai* as well; his work appears to have been titled *Ephemerides*.

¹⁷ Virgil's engagement with Aratus in the second half of the first *Georgic* has received considerable attention. Katz 2008, however, considers a particularly intriguing and hitherto overlooked Virgilian encounter with Aratus at the opening of the *Georgics*. In general, Hübner 2005 provides a recent review of Aratus' influence at Rome.

scientific poetry has clear social and political implications as well. As Rome gradually took control of the Mediterranean world, Roman poets appropriated one Greek literary genre after another. Both Greek poetry and Greek learning came to Rome and were reformulated in Roman terms and redeployed within Roman contexts. The authors that figure in this dissertation stand at one end of this process of intellectual and literary appropriation.

The notion that scientific learning can offer practical benefits has a similarly lengthy and complex history, and we need to consider it from two related perspectives, the practical value of science itself and the practical value of poetry. On the one hand, ancient writers regularly discuss the utility of the various scientific fields. Then, as now, medical knowledge served clear utilitarian purposes, and a writer like Pliny can describe the natural world in the interest of rendering it serviceable for the emperor and his fellow citizens.¹⁸ In addition, some authors characterize the sciences as offering a combination of both tangible and moral benefits. Mathematical knowledge, for instance, makes possible the construction of siege engines and aqueducts, but a variety of both Greek and Roman writers reflect on the ethical value and spiritual enlightenment that come from a serious study of the order and regularity of numbers.¹⁹ On the other hand, there exists a longstanding and widespread ancient belief that poetry is or should be useful, and we find statements to this effect in both poets and prose authors alike. Theognis and Solon, for example, offer ethical and political advice, and Aratus teaches his readers to predict the weather so that they might sail without danger and know when to perform the various tasks of the farm. Such claims are a commonplace of didactic poetry, and however

¹⁸ As French 1994: 207 observes, “Pliny was highly aware that at every turn man depended on nature’s gifts... nature had made all things for him, and Pliny’s book was partly a survey of what was available”.

¹⁹ Cuomo 2001: 192-211 offers a stimulating analysis of the differing claims about the utility of mathematical knowledge in the Greco-Roman period.

we interpret them today, it is clear that a wide variety of Greek and Roman writers took this kind of language seriously.²⁰ Horace, in fact, turns this attitude into an aesthetic slogan. In the *Ars Poetica*, he declares: “poets want either to be beneficial or to please or simultaneously to say things that are both pleasant and fitting for life” (*aut prodesse volunt aut delectare poetae | aut simul et iucunda et idonea dicere vitae*, 333-4). The poet then promotes a literary combination of the *utile* and the *dulce*, and his deeply philosophical *Odes* and *Sermones*, not to mention his composition for Augustus’ *Ludi Saeculares*, demonstrate just how powerful and varied this combination could be.²¹ Although non-poetic sources confirm that poetry did in fact serve practical goals, these goals are not necessarily the ones that the poets themselves chose to emphasize. For example, as the papyrological record and the expansive scholiastic and exegetical traditions attest, the texts of Homer and Virgil played vital roles at virtually every level of ancient education.²² In fact, Caecilius Epirota appears to have introduced Virgil into his curriculum even before the poet’s death (Suet. *Gramm.* 16.3). Moreover, someone like Plutarch can advocate the study of poetry as a propaedeutic to philosophy, and even Plato’s Socrates finds a role in his ideal state for the composition of hymns to the gods and encomia for the good (*Rep.*

²⁰ Cinna fr. 11 Courtney (= 13 Hollis), for example, partially following Callimachus *Ep.* 27 Pf. (= 56 G-P) claims that it is through Aratus’ *Phaenomena* that we actually know the stars (*quis [sc. carminibus] ignes novimus aërios*). Intriguingly, Christmann 1982 discusses passages in which Columella and Pliny actually cite the *Georgics* as an authoritative source for specialist knowledge. Seneca *Ep.* 86.15, however, declares that Virgil had no intention of actually teaching farmers: *nec agricolas docere voluit, sed legentes delectare*, “he did not wish to teach farmers, but [rather] to delight his readers”. Volk 2002: 3-5, 36-9 and 2009: 174-82 provides a sensible modern approach to interpreting didactic claims to utility.

²¹ That poetry is or should be pleasing is another longstanding and widely held ancient belief, and can be traced as far back as the Homeric poems (e.g., Phemius’ performance in *Od.* 1).

²² Criboire 2001, who draws extensively on the papyrological record, amply illustrates the varied uses of Homer and other Greek poets in ancient education. A quick glance at nearly any page in the Servian corpus performs a similar task for Virgil.

10. 607a).²³ Both the sciences and the poetic tradition served, or could be imagined to serve, a range of practical purposes.

Not everyone in antiquity, however, viewed the relationship between science and poetry as straightforward or unproblematic. At the same time, numerous critics complicated or called into question the practical applications of both scientific knowledge and poetic texts. For our purposes, we need to consider simply the immediate intellectual context within which Manilius, Lucan, and the *Aetna* poet operate. Accordingly, I will consider briefly some of the ways in which Lucretius and Ovid set the stage for the subjects of the following chapters.²⁴

Although none of our main authors subscribes to Epicureanism and two of them repeatedly attack the arguments of the *De rerum natura* (i.e., Manilius and Lucan), Lucretius' poem exerts a pervasive influence on all three texts. For now, however, I want to focus on three related issues, all of which have received considerable attention in the relevant scholarly literature; I wish only to draw attention to them here. First, Lucretius clearly conceives of poetry as the most suitable medium for communicating his Epicurean lessons. It is well known that the poet characterizes the lines of verse, individual phrases, and even the very letters of his poem as microcosms or mirrors of the atomistic structure of his universe.²⁵ Like Manilius, Lucretius encourages the reader to see a fundamental connection between the form and content of his work

²³ Bréchet 1999 and Saïd 2005 provide highly suggestive readings of Plutarch's stance, which constitutes an interpretation and reformulation of various Platonic texts. Of course, Plato's views on poetry are notoriously complex; this is not the place to discuss them.

²⁴ The *Georgics* constitutes another significant model for all three of our authors. Critics such as Ross 1987 and Thomas 1988 have read that poem as profoundly skeptical in its representation of the utility of knowledge and/or human *labor*; I have no doubt that Lucan read the poem from a similar perspective, and it is possible that the *Aetna* poet did so as well. Although a discussion of the *Georgics* along these lines could be added to this introduction, I have decided to focus only on Lucretius and Ovid simply in the interest of space.

²⁵ Note, for instance, 1.823-7, and see Friedländer 1941 and Volk 2002: 100-18.

that makes the choice to compose in verse appear both natural and philosophically significant.²⁶ Second, Lucretius invests poetry in general and his brand of scientific poetry in particular with great practical value. Again, it is well known that poetry acts as the honey on the cup that allows the reader to swallow the potentially bitter medicine of the poem's philosophical lessons (1.936-50 = 4.11-25). At the same time, this medicine is designed to free the minds of the readers from superstition and the fear of death and so simultaneously to lead them towards Epicurean *ataraxia*. Third, Lucretius appears to complicate or even undermine this project in a variety of ways, a possibility generally referred to as the "anti-Lucrèce chez Lucretius" theory.²⁷ Metaphors and analogies, for instance, can animate or even anthropomorphize the atoms and thereby undercut the ostensibly mechanistic model of Lucretius' universe (e.g., *mater* at 1.168, or *foedera naturai* at 1.586). Similarly, the lengthy mythological digression on the Great Mother threatens to invalidate the poem's attitude towards the gods (2.600-60). And most famously, the work's abrupt conclusion in the middle of a scene of great suffering and hardship may test the reader's mastery of the Epicurean subject matter, but strikes many as a pessimistic showpiece that lays bare the futility of Lucretius' poetic project and the impossibility of achieving tranquility through verse (6.1138-1286). Whatever position we as modern readers take on the "anti-Lucrèce chez Lucretius" theory, these types of difficulties exercise a suggestive influence on later writers. Lucretius' catastrophic conclusion constitutes a vivid model for the devastating volcanic eruption with which the *Aetna* draws to a close, and both scenes prompt their readers to reflect on the value and limitations of scientific poetry. Similarly, Lucan's treatment of didactic

²⁶ Volk 2009: 195-6 compares the two stances.

²⁷ The problem has been the subject of considerable debate, and I do not mean to add to the controversy. Some stimulating contributions that deal with the issues outlined here include Schrijvers 1978, Gale 1994, Kennedy 2002, and Garani 2007. Gale 2007 discusses the history of the problem and the positions adopted by different scholars.

poetry draws inspiration from the potential collapse of scientific learning and the benefits that Lucretius promises to confer through song. If Lucretius hints at such a failure and decides to continue composing verse anyway, Lucan renders the failure explicit and conspicuously refuses to write a didactic poem.²⁸

The role of scientific theory in Ovid's *Metamorphoses* has also received critical attention.²⁹ I will restrict myself to two significant passages and suggest their importance for Manilius, Lucan, and the *Aetna* poet. Although the *Metamorphoses* explains the origins and workings of numerous aspects of the natural world through mythological narratives, some of these narratives show a clear understanding of scientific theory and conspicuously play with the relationship between science and mythological poetry. The story of Boreas and Orithyia at the end of *Met.* 6 provides a striking example. Ovid links the story to and locates it in between his accounts of Tereus, Procne, and Philomela and the voyage of the Argonauts. When Boreas, the fully anthropomorphized god of the north wind, laments his inability to woo Orithyia with words, he offers reflections on his physical powers and makes the following observation:

idem ego cum fratres caelo sum nactus aperto
 (nam mihi campus is est), tanto molimine luctor,
 ut medius nostris concursibus insonet aether
 exsiliantque cavis elisi nubibus ignes;
 idem ego cum subii convexa foramina terrae
 supposuique ferox imis mea terga cavernis,
 sollicito manes totumque tremoribus orbem. (6.693-9)

Likewise, when I have met my brothers in the open sky (for this is my battlefield), I fight with such force that the air around us resounds with our attacks and fires are pressed out and leap forth from the hollow clouds; likewise, when I have gone down into the hollow

²⁸ I agree with Volk 2011: 107-9, who accepts some version of the “anti-Lucrèce chez Lucrèce” theory, but who argues that various inconsistencies or self-contradictions in Manilius do not serve a similar purpose. As we will see, Manilius is entirely optimistic about the results of his own scientific project; his skepticism and doubt concern other areas of inquiry.

²⁹ Myers 1994 is a particularly comprehensive and valuable study.

openings of the earth and fiercely placed my back below the lowest caverns, I disturb the shades and the whole world with my shaking.

The imagery and vocabulary of fighting winds is traditional and common to a number of poetic genres; both Virgil and Horace, for instance, use *luctor* to describe such phenomena (e.g., *Aen.* 1.53 and *Carm.* 1.1.15, respectively). At the same time, however, Boreas offers an account of the causes of thunder, lightning, and earthquakes that shows a clear familiarity with meteorological theory. Lucretius, whose terminology Ovid borrows, connects thunder with the violent fighting of the winds (*DRN* 6.96-8). So, too, Seneca suggests that lightening might occur when the winds violently strike or rub the clouds (*NQ* 2.22.2).³⁰ In addition, numerous authorities—not least of all the *Aetna* poet (146-54)—attribute earthquakes and other seismic phenomena to the violent activities of subterranean winds. Ovid, then, humorously combines mythological narrative with a dose of hardcore scientific theory. Although words carried by the winds are traditionally empty or futile, Boreas' words come loaded with intellectual weight.³¹ Moreover, the scientific tradition upon which Ovid draws completely rejects the type of mythological story lines through which Boreas explains or accounts for these phenomena. Although he adopts the language and arguments of such theorists, Ovid redeploys them within a mythological context that runs completely counter to their broader intellectual framework.³² Similarly, many such scientists seek to explain natural phenomena such as lightning and earthquakes with a practical purpose in mind, namely, to eradicate the fear that they engender.³³

³⁰ Seneca apparently follows Theophrastus. See Hine 1981: 292-5.

³¹ See the extensive list of passages cited at Otto 1890: 364-5 s.v. *ventus* 2. Intriguingly, although Notus and Eurus appear in a number of these passages, none mentions Boreas.

³² Myers 1994: 56 assumes that Ovid takes aim specifically at Lucretius.

And yet, Ovid's Boreas seems to delight precisely in his ability to cause this kind of emotional turbulence—his *sollicito* (6.699) points both to the physical shaking of the earth and to the notoriously disturbing anxiety or unrest that such shaking produces.³⁴ I want to emphasize two points. On the one hand, this kind of maneuver suggests that scientific theory and literary convention can work together. Ovid does not imply that Lucretius, or anyone else for that matter, incorrectly explains the causes of thunder and lightning. Rather, Boreas' speech accepts the validity of contemporary meteorological theory and then supplements or reconfigures it with traditional poetic motifs. This delicate balance constitutes an important model for the *Aetna* poet. The *Aetna* poet does not reject the scientific explanation of his mountain's volcanic activity. Instead, he provides the reader with additional traditions and perspectives from which to conceptualize the mountain and its place in the natural world. On the other hand, this kind of scene shows Ovid trying to find a way to write narrative epic with scientific content. The incorporation of scientific material into this traditional framework provides an important model for Lucan. Ovid lays the generic groundwork that allows Lucan emphatically to remove the gods from the affairs of men and routinely to explain the natural world in purely scientific terms.³⁵

³³ Seneca, for instance, makes numerous such declarations in the *NQ*. His account of earthquakes ostensibly serves the following purpose: “comforts for the anxious are to be sought, and great fear is to be removed” (*quaerenda sunt trepidis solacia, et demendus ingens timor*, 6.1.4). As Taub 2003: 125-6 observes, this sort of motivation for meteorological study appears already in Theophrastus.

³⁴ Myers 1994: 56 focuses on the fact that Boreas had tried to pursue his love with words, but now decides to use force (*apta mihi vis est*, 6.690). She rightly argues that the whole passage ironically equates rape (= *vis*) with a natural force (= *venti vis*, as at *DRN* 1.271). From this perspective, Boreas' *sollicito* will be directed at Orithyia in particular and perhaps seem a little more sinister.

³⁵ Cf. Lausberg 1990: 182, who suggests that the *Metamorphoses* acted as a kind of gateway through which didactic material entered the world of epic, and so provided Lucan with an

Pythagoras' lengthy speech, which runs from *Met.* 15.75 to 478, provides another important background text. Ovid introduces the speech in the following way:

cumque animo et vigili perspexerat omnia cura,
 in medium discenda dabat coetusque silentum
 dictaque mirantum magni primordia mundi
 et rerum causas et quid natura docebat,
 quid deus, unde nives, quae fulminis esset origo,
 Iuppiter an venti discussa nube tonarent,
 quid quateret terras, qua sidera lege mearent,
 et quodcumque latet, primusque animalia mensis
 arguit inponi, primus quoque talibus ora
 docta quidem solvit, sed non et credita, verbis. (15.65-74)

And when he had clearly perceived all things with his mind and wakeful attention, he used to make public things worthy to be learned and he used to teach the crowds, who were silent and wondered at his words, the beginnings of the great universe and the causes of things and what nature was, what god was, whence snows came, what was the origin of lightning, whether Jupiter thundered or whether it was the winds when the clouds were struck, what shook the earth, by what law the stars moved, and whatever lies hidden, and he was the first to condemn placing animals on tables, and he was also the first to unleash with such words a mouth that was learned indeed, but not actually believed.

Since Latin didactic regularly announces its subject matter through a series of indirect questions, the series of indirect questions here immediately connects the present passage with Latin didactic,³⁶ and recent scholarship has emphasized that the following speech shows numerous points of contact with Empedocles, Lucretius, and Virgil.³⁷ It has also been argued, however, that Pythagoras' speech constitutes a parody of such didactic poems, and this is what I want to

important model. Lausberg, however, writes about traditional didactic topoi, such as the plague topos, not scientific theory per se.

³⁶ For such lists of indirect questions, see, e.g., *Lucretius* 1.54-7, 75-7, 127-35, *Virgil Geor.* 1.1-5, *Germanicus* 11-14, and *Aetna* 1-4. In addition, cf. didactic or natural philosophical “set-pieces” such as *Virgil Buc.* 6.31-40, and *Aen.* 1.742-7, and note *Statius Silv.* 5.3.19-23, where a similar series of indirect questions is explicitly connected with Aratus.

³⁷ Note, in particular, Myers 1994: 133-66 and Hardie 1995.

focus on here.³⁸ Although Pythagoreans were notoriously mysterious and made use of initiation rites, secret doctrines, and even passwords, Ovid characterizes Pythagoras himself as a kind of traveling sophist who would publically recite didactic poems on the whole of nature. Unfortunately, his audiences appear not to accept or even understand a single word. Ovid explicitly states that Pythagoras possessed great erudition but was not believed (*primus quoque talibus ora | docta quidem solvit, sed non et credita, verbis*), and that the groups of silent awestruck listeners who correspond to the readership of didactic poetry (*coetusque silentum | dictaque mirantum*) cannot follow his account.

Moreover, despite the claim that Pythagoras regularly addressed large audiences, the speech to follow, which begins at 15.75 and lasts for more than 400 lines, has no audience at all. The opening of the book follows Numa to Croton, where he wished to extend his knowledge beyond the habits of the Sabines and sought to understand the nature of the universe (*quae sit rerum natura requirit*, 15.6) before he began to rule. And yet, Ovid never actually brings Pythagoras and Numa into direct contact. After the speech runs its excessive course, Numa suddenly appears: “they say that once he had been instructed in his breast with such and other kinds of words, Numa returned to his fatherland and was actually asked and then accepted the reins of the Latian people” (*talibus atque aliis instructum pectora dictis | in patriam remeasse ferunt ultroque petitum | accepisse Numam populi Latialis habenas*, 15.479-81). Once again, Numa and Pythagoras do not actually meet, and Ovid even suggests that Numa had only heard words that more or less conveyed the gist of Pythagoras’ teachings. There are two jokes in play

³⁸ Volk 2002: 67 suggests and 2005b: 163-4 argues that the speech constitutes a parody. Myers 1994: 135-6 contends that the speech underscores the similarities between mythological and natural philosophical explanations of the natural world and so “expose[s] the difficulty of trying to make sense at all of [Ovid’s] world through either of these traditional means”. She also notes, however, that the entire scene provides one more instance of Ovid’s “humorous ‘inversion’ of philosophical physics”.

here. First, Ovid manifestly mocks the traditional story that associated Pythagoras and Numa. Cicero had shown the chronological impossibility of such an encounter on two occasions, and both Livy and Dionysius of Halicarnassus offered similar refutations.³⁹ Ovid affects to show the two figures coming together, but employs an inordinately long narrative to distract the reader and then, with a little poetic prestidigitation, pulls the rug out from under his feet. Second, and more to the point for us, Ovid offers a subtle critique of didactic poetry, its rhetoric, and its readers. As we have seen, Numa comes to Croton to learn the *rerum natura* before he undertakes his rule, that is, he wants a Lucretian lesson, and Pythagoras will play the part of the didactic poet. Ovid's introduction to the Pythagoras narrative, then, suggests that even though didactic poems contain accurate information, nobody can actually make sense of them, and many simply do not believe what they have to say no matter what. But we have also seen that didactic poets regularly claim to provide useful information, and it is significant Roman didactic poets tend to address their poems to prominent public or political figures (e.g., Memmius, Maecenas or, in this case, Numa). That Pythagoras fails to communicate with Numa and Numa in turn fails to learn from or even to meet with Pythagoras suggests that the public and/or political figures in question never actually bother to read these poems in the first place, and that such a superabundance of learning does not really serve any useful purpose. Of course, no one at Rome seems to realize this. Numa returns home and assumes the throne, and everyone continues to celebrate his close connection with Pythagoras.

From our perspective, I want again to emphasize two simple points. On the one hand, this narrative raises issues with which Lucan plays. Book 9 reveals the impossibility of applying

³⁹ See Zetzel 1995: 184-5 on Cic. *Rep.* 2.28-30, who notes that the story might have originated with Aristoxenus of Tarentum in the late 4th or early 3rd century. In addition to this passage from *Rep.* 2, see Cic. *TD* 4.2-3, Livy 1.18.1-3, and Dion. Hal. *Ant. Rom.* 2.59. Cf. Cic. *De orat.* 2.154.

didactic learning in the real world, and Book 10 shows another prominent Roman politician failing to receive or understand a rather dubious didactic lesson. Lucan offers a rather harsher judgment on the value and function of such poetry, but Ovid paves the way by using didactic themes and language in a non-didactic composition precisely to undermine didactic poetry. On the other hand, Ovid's satirical undermining of the value of scientific learning establishes an important model for Manilius and the *Aetna* poet. Although they do not laugh at science, Manilius and the *Aetna* poet try to separate scientific learning from the world of practical affairs. The *Aetna* poet restricts science's influence and counterbalances it with poetic tradition; he revels in the theories of meteorology, but suggests that they do not have any use other than providing intellectual pleasure. Ovid's Pythagoras also represents an investigator of nature who does not apply his learning to any practical ends, but who still enjoys singing a lengthy scientific song. Devoid of an audience or addressee, he undertakes his scientific exposition for the sheer joy of understanding and celebrating the causes of the natural world—he even sings about the causes of Aetna's volcanic fires (15.340-55). Similarly, Manilius turns science into an abstract mathematical game in which he indulges wholeheartedly. Like Ovid's Pythagoras, Manilius provides a superabundance of abstract information that seems to distance the song itself from the very idea that such learning could be put to practical use. But when Pythagoras actually opens his mouth, his sermon on metempsychosis, vegetarianism, and various natural phenomena continually emphasizes the change and flux that everything in the cosmos perpetually undergoes. Manilius, by contrast, describes a world full of constancy and order, one that obeys eternal mathematical laws. With this in mind, we will now turn to Manilius and his mathematical *mundus*.

Chapter 2: Manilius and the Mathematics of the *mundus*

This chapter will explore the role of mathematics in Manilius' *Astronomica*. Throughout the poem, Manilius teaches the reader to perform certain astronomical calculations that ostensibly allow the astrologer to cast a reliable horoscope. Instead of considering the accuracy or inaccuracy of Manilius' numbers, I will examine the programmatic weight that the poet attaches to the mathematical operations themselves. I will argue that Manilius repeatedly defines his authorial persona through his own mathematical expertise and uses his mathematical dexterity to set himself apart from other poets and scientists. At the same time, the world itself becomes a fundamentally mathematical entity, and only the ability to perform a variety of mathematical tasks can produce accurate or reliable information about the *mundus*.¹

Before we begin, I want to make several preliminary observations that will set the stage for the rest of the chapter. Greek mathematicians divide their discipline into several categories, and Hellenistic schematizations present arithmetic and geometry as the two highest or purest mathematical fields, from which they derive six others.² Most of Manilius' mathematical

¹ Modern critics regularly note the presence of mathematics in the *Astronomica*, but do not consider the programmatic and literary work that they perform. Housman sets the tone when he famously observes "the pleasure [Manilius] takes in exercising that eminent aptitude for doing sums in verse which is the brightest facet of his genius" (1903-30: 2.xiii), and later bemoans the poet's apparent mathematical incompetence (1903-30: 3.xxi). Kennedy 2011 constitutes the one major exception to this trend; he discusses a number of the passages that figure in this chapter and offers a variety of stimulating readings. Note that Housman 1903-30 and Goold 1992 provide essential assistance in making sense of Manilius' mathematical Latin; I have referred to both works frequently. I follow the text of Goold 1992 as well.

² Geminus fr. 2 Aujac (= Proclus *In Euc.* 1 pp. 38ff. Friedlein) lists the branches as arithmetic, geometry, mechanics, astronomy, optics, geodesy, canonic, and logistic, and then discusses their respective areas of knowledge and their relationships to one another. Heron *Def.* p. 164 Heiberg gives the same divisions, but in a different order and without commentary. Aujac 1975: 162-8

operations are relatively straightforward and belong to the fields of logistic and geodesy, which are the practical applications of arithmetic and geometry to material or visible objects. From an ancient perspective, arithmetic is the theory of numbers, and it is logistic that deals with elementary operations such as addition, subtraction, multiplication, division, and fractions, namely, what we now call arithmetic. Similarly, ancient usage makes geometry entirely theoretical and assigns to geodesy the task of actually measuring actual things. At the same time, it should be kept in mind that astronomy itself constitutes a separate branch of ancient mathematical knowledge and relies heavily on the principles of geometry, as well as logistic and geodesy. Although he does not discuss epicycles or deferents, Manilius shows a clear awareness of some of ancient astronomy's problems and methods, and it is possible to categorize much of his mathematics under the heading of astronomy. We also need to remember, however, that Greeks and Romans see a particularly close connection between mathematics and astrology itself, a state of affairs mostly clearly symbolized by the term *mathematicus*, which means both “mathematician” and “astrologer”. Unsurprisingly, this connection can be viewed from multiple perspectives. When he urges Leuconoe not to consult the astrologers, for instance, Horace singles out for censure the *numeri* of the Babylonians, drawing on the popular conception of astrologers as obscure figures who are immersed in their calculations (*Carm.* 1.11). But actual astrologers could present the matter quite differently, and a remarkable prefatory letter to an ancient horoscope preserved on papyrus stresses the importance of mathematics to astrology:

[Τ]ῶν αἰγυπτίων οἱ τὸ παλαιὸν ἀνδρες γενομένοι... ἀφθονῶς ἡμεῖν διὰ κανόνων αἰώνιων ἀπελείπον τὴν περὶ αὐτῶν γνῶσιν ὅθεν ἕκαστον ψηφισαὶ ἀκριβῶς τεταχά σοι πρὸς τε

provides valuable notes to Geminus' analysis. Heath 1921: 1.11-18 discusses the ancient classifications of mathematics more fully.

μοιραν και λεπτον εχημα τ[ε] και φαειν... Ουτως γαρ ο εν αστρολογια προρητικος τροπος αναμφιβολος τουτεστιν ομολογος κατορθουται. (*P. Lond.* 130 col. 1-2).³

“The Egyptian men of old... generously left us in perpetual tables their knowledge [of heavenly things and especially the movements of the seven gods]. From these, I have accurately calculated and arranged for you for each [of the seven gods] according to degree and minute and phase... For in this way the method of prediction in astrology succeeds and is made unambiguous, that is, consistent”

What matters for us is that the author of this letter proudly emphasizes the careful mathematical calculations that he has personally performed (*ψηφιασ ακριβως*), and stresses that only with such diligence can astrology make accurate predictions.⁴ Despite such boasting, the papyrus itself does not actually show the author performing any mathematical tasks—it contains a lot of numbers, but the actual calculations and measurements take place behind the scenes. As we will see, Manilius develops this kind of rhetoric in striking ways and repeatedly carries out a wide variety of mathematical operations in public, and many of these operations extend far beyond the actual ambit of practicing astrologers. Manilius radically mathematicizes or astronomizes astrology.

³ The text can also be found at Neugebauer and Van Hoesen 1959: 21-3. As printed, the papyrus contains no accents, breathings, etc., and I have not added them.

⁴ As the papyrus’ original editor observes, the horoscope itself is for 1 April 81 CE but applies the epithet *θεός* (= *divus*) to the emperor Titus and so must date to some time after his death; it is tentatively assigned it to the 1st or 2nd century CE. It should be noted that the only translations of the papyrus that I have found contain an error. The writer states that the Egyptian men of old generously transmitted their knowledge of the stars to posterity in perpetual tables *περι τα ουρανια φιλοπονησαντες και επιγνοντες την των επτα θεων κεινην τα ολα ε[υ]νεχουσαν τε και διοικουσαν*, “having labored over heavenly things and having recognized that the movement of the seven gods holds together and orders the whole”. Both Neugebauer and Van Hoesen 1959: 23 and Cuomo 2001: 148 mistakenly construe *ε[υ]νεχουσαν* and *διοικουσαν* with the Egyptian men of old, taking the whole phrase closely with *δια κανονων αιωνων*, and translate thus: “[they] compiled and arranged everything in perpetual tables”.

It is also important to keep in mind that ancient attitudes towards mathematics differ widely.⁵ Some authors completely deny the significance of such learning. Seneca, for instance, complains that geometricians teach people how to measure their estates and so implicitly promote a concern with material goods rather than ethical or philosophical problems (*Ep.* 88.10-13). Other writers consider training in mathematics to form an essential part of a liberal education, but simultaneously subordinate mathematical knowledge to different or higher kinds of learning. Plato's Socrates, for example, argues that arithmetic, calculation, plane and solid geometry, and astronomy and harmonics, which he presents as fundamentally mathematical and closely related, constitute necessary areas of education for the future guardians of his ideal state (*Rep.* 7. 521b – 532e). Although these areas of inquiry, properly conceptualized and pursued, study being, rather than becoming, and lead to truth, nevertheless they are only the indispensable preludes to the study of dialectic, which is in fact the song that must be learned.⁶ Another group of writers suggests that certain kinds of mathematical knowledge possess great practical or even moral significance, and Ptolemy develops a particularly ambitious formulation of this idea. Building off Plato, Ptolemy claims that, more than any other science, mathematics encourages virtue in conduct and character, and that the habitual contemplation of the constancy and order of the universe through mathematics produces constancy and order in the soul and can even turn the

⁵ The discussion of Greco-Roman mathematics at Cuomo 2001: 143-211 fundamentally informs this paragraph; she mentions Manilius only once and provides no substantive analysis (p. 174).

⁶ Heath 1921: 1.12 notes that Plato's list corresponds to the Pythagorean *quadrivium* of geometry, arithmetic, astronomy, and music. Cf. *Laws* 7. 817e – 818a, where the Athenian stranger discusses arithmetic, calculation, geometry, and astronomy. For the *quadrivium* itself, see Archytas DK 47 B 1; it is discussed briefly below in section 3. Romans like Cicero, Vitruvius, and Quintilian present mathematical study in a way similar to Socrates' formulation, turning it into a necessary body of knowledge with which the ideal orator or architect must be familiar. In the *De oratore*, Cicero clearly follows Plato's example, and both Vitruvius and Quintilian manifestly follow Cicero.

student into a lover of the divine (*Synt.* 1.1 p. 7 Heiberg).⁷ It is not surprising that the vast majority of those who make such claims count as mathematicians themselves or rely heavily on mathematics in their writings, and we will see that Manilius belongs to this group.

The following discussion falls into three sections. I will begin by examining the relationship between mathematics and poetry in Hellenistic and early Imperial Latin literature, and by arguing that Manilius uses mathematics to distance himself from more traditional forms of poetry. Then I will investigate the uses of applied geometry and arithmetic in Books 2-3, where the poet's programmatic rhetoric and ability to marshal and evaluate alternate methods of calculation suggest the reliability of mathematical knowledge and the order of the cosmos. Finally I will consider a series of passages devoted to addition and enumeration from Books 3-5 that hint at a deeper philosophical or moral significance for the astrologer's mathematical enterprise.

1. Mathematics and the Greco-Roman Literary Tradition

Although several Hellenistic authors perform mathematical operations in verse, Roman writers do not appear to have taken to the composition of mathematical poetry, and at least one of them implies that mathematics and poetry are fundamentally incompatible. It is my contention that Manilius recognizes this value judgment and exploits the familiar connection between astrology and mathematics to set himself apart from traditional Roman literary canons. I will argue that this process attains explicit programmatic status in several passages where the astrologer pointedly contrasts mathematical poetry about the stars with more familiar forms of verse and

⁷ The emphasis on habituation and mathematics recalls, e.g., *Republic* 7, and the combination of erotic and divine imagery suggests, e.g., *Symposium*.

turns the bucolic world upside down, as singing rustics morph into urban mathematicians and shambling herds turn into pieces of a complex mathematical game. These types of dramatic and conspicuous juxtapositions are one of the hallmarks of Hellenistic poetry in general and Callimachean poetry in particular, and the poem well represents the literary sensibilities of the age.⁹ Another particularly striking example of Hellenistic mathematical poetry is Eratosthenes' epigram about an instrument that allows one to double a cube; Eratosthenes invented and set up the instrument as a dedication and wrote the epigram to accompany it.¹⁰ Doubling the cube constituted a familiar or even clichéd geometrical problem in antiquity, and Eratosthenes's decision to talk about it in verse comes as a surprising innovation. Instead of focusing on the mathematical language of the poem, I want to consider how Eratosthenes engages in a kind of mathematical polemics with competing intellectuals: "Do not look for Archytas' difficult works on cylinders, or to make three-fold conic sections à la Menaechmus, or for the form that is curved in lines drawn up by godlike Eudoxus" (μηδὲ σύ γ' Ἀρχύτεω δυσμήχανα ἔργα κυλίνδρων | μηδὲ Μεναιχμείους κωνοτομεῖν τριάδας | δίζηται· μηδ' εἴ τι θεουδέος Εὐδόξιοιο | καμπύλον ἐν γραμμαῖς εἶδος ἀναγράφεται, fr. 35.7-10 Powell). Eratosthenes playfully juxtaposes traditional

⁹ Mugler 1971: 167 wonders "Pourquoi Archimède n'aurait-il pas eu l'humeur de présenter son problème comme une «bucolique», au sens étymologique du terme, mise sous la forme d'une épigramme?" I have no doubt that Archimedes had a sense of humor about the poem. Netz 2009: 167-8 considers the poem's connection with Sicily from a political perspective and asks "Was the point perhaps that Sicily's power was indeed immeasurable?"

¹⁰ Fr. 35 Powell (= Eutoc. *Comm. in Archim. de sphaera et cylindro ii* pp. 96-7 Heiberg). Recently, Geus 2002: 133-6 and Netz 2002: 213-5 and 2009: 160-4 discuss the poem; Geus dates it to ca. 234 BCE. Eutocius also provides a theoretical account of Eratosthenes' solution (*Comm. in Archim. de sphaera et cylindro ii* pp. 90-6 Heiberg). Thomas 1939-41: 1.256-308 collects Eutocius' scattered discussions of ancient attempts to double the cube, making clear that the problem constituted something of a cliché. Note that Eratosthenes' now extremely fragmentary *Hermes* (fr. 1-16 Powell + *SH* 397-8) must have contained a good deal of mathematics. Geus 2002: 110-28 discusses that poem and says: "Während ihn ein Teil als astronomisches Lehrgedicht betrachtet, bezeichnet ihn ein anderer Teil als Hymnos oder als mythisches Epyllion über das Leben des Gottes Hermes" (p. 111).

epic diction (e.g., *καμπύλος*) with more technical neologisms (e.g., *κωνοτομεῖν*), and creates a comical geometrical genealogy—Archytas taught Eudoxus, and Eudoxus taught Menaechmus. Since Archytas was widely considered the founder of mechanics (D.L. 8.83), the idea that his devices should be *δυσμήχανα* constitutes a particularly pointed jab, and the sarcastic epithet *θεουδής* likely points either to Eudoxus’ work on astronomy, which deals with the divine, or to the time he spent with Egyptian priests (D.L. 8.86-7).¹¹ After an address to the young Ptolemy that establishes a close connection between the author and the royal family, the poem ends with a traditional appeal to the passerby who happens to read the inscription: “And may someone say, when he looks at the dedication: this is the work of Cyrenaean Eratosthenes” (*λέγοι δέ τις ἄνθεμα λεύσσω· | τοῦ Κυρηναίου τοῦτ’ Ἐρατοσθένεος*, fr. 35.17-8 Powell). Eratosthenes identifies his homeland and name with none of the irony that permeates his references to other intellectuals, and implies that he himself stands at the end of the mathematical genealogy he had previously constructed.¹² Eratosthenes’ mathematical device far excels all other available means for doubling a cube, and the scholar uses a traditional poetic form to establish his intellectual superiority in a very public way. Hellenistic authors compose erudite, allusive, and innovative epigrams, and this is no exception.¹³

¹¹ Cf. Geus 2002: 134 n.224 on *θεουδής*. Although *θεουδής* literally = “fearing god”, LSJ s.v. states that later writers treat it as the equivalent of *θεοειδής*, and this seems to be its meaning here. In a prose letter addressed to Ptolemy, discussed below and also preserved by Eutocius, Eratosthenes complains about the theoretical and hence impractical solutions of Archytas, Eudoxus, and Menaechmus, and contrasts his own discovery of an easy mechanical solution. Plutarch *Mor.* 718e, however, reports that Plato criticized Archytas, Eudoxus, and Menaechmus precisely because they constructed physical cube-duplicating devices rather than formulating entirely theoretical solutions; see Cuomo 2001: 52-3.

¹² The creation of a poetic genealogy, often fused with a scene of poetic initiation, is a regular way to highlight one’s influences and simultaneously to suggest that one has surpassed them.

Greek mathematicians, then, are able to compose complex mathematical poems that engage in the same type of literary games and display the same kind of literary sophistication as the works of their non-mathematically oriented contemporaries. In addition, the activities of Archimedes and Eratosthenes demonstrate that some of the most preeminent Hellenistic intellectuals took such literature seriously. Like his fellow-Cyrenaean Callimachus, Eratosthenes was the head of the Alexandrian library, and we know that Archimedes actually sent Eratosthenes a copy of the *Cattle Problem* to circulate among those in Alexandria who were interested in such matters.¹⁴ Similarly, Eutocius preserves a letter that Eratosthenes sent to Ptolemy in which he quotes three lines of tragic verse and discusses the history of doubling the cube, boasting again of the superiority of his own method.¹⁵ Although mathematics did not occupy a central position in Hellenistic poetry, it attracted attention at the highest levels.

At Rome, there is considerably less evidence for mathematical poetry. Roman poetic sensibilities seem fundamentally opposed to the idea of creating such a literature, and Horace provides a striking example of the latent hostility towards the very possibility of combining mathematics with verse. In the *Ars poetica*, Horace declares that the Muse gave the Greeks

¹³ Netz 2009: 163 examines the generic variety of the poem and argues that the epigram as a whole “wraps [its] mathematical content within a rich mosaic of interlocking generic suggestions”. This too is a common maneuver in Hellenistic poetry.

¹⁴ Heiberg’s ed. reports the readings of two mss. of the poem, both of which begin with a brief note explaining that Archimedes sent the work to Eratosthenes for this reason. Archimedes also dedicated his work on mechanics, the *Methodos*, to Eratosthenes. For possible connections between Eratosthenes and Callimachus, see Geus 2002: 136 + n.233.

¹⁵ Eut. *Comm. in Archim. de sphaera et cylindro ii* pp. 88-90 Heiberg (= Thomas 1939-41: 1.256-60). Although numerous critics have disputed the authenticity of the letter (most recently Geus 2002: 134), I side with Netz 2002: 213 n.57, who discusses the letter in connection with the epigram and sees no reason to suspect Eratosthenes’ authorship. Both documents engage in lighthearted mathematical polemics and the same playful exploitation of literary conventions.

talent and the ability to speak with a smooth or well-rounded style, adding that they lust after nothing other than praise (324-5). The Romans, he then says, are quite different:

Romani pueri longis rationibus assem
 discunt in partibus centum diducere. ‘dicat
 filius Albini: si de quincunque remota est
 uncia, quid superat? poteris dixisse.’ ‘triens.’ ‘eu!
 rem poteris servare tuam. redit uncia: quid fit?’
 ‘semis.’ an, haec animos aerugo et cura peculi
 cum semel imbuerit, speremus carmina fingi
 posse linenda cedro et levi servanda cupresso? (AP 325-32)

Roman boys learn to divide the *as* into one hundred parts through long calculations. “Let the son of Albinus speak: if one twelfth is taken away from five twelfths, what remains? You could have spoken [already].” “One third.” “Bravo! You will be able to keep your money. One twelfth is added: what is produced?” “One half.” Can it be that, once this greedy rust and concern for property have imbued the mind, we may hope that poems can be fashioned that are worthy to be smeared with cedar oil and preserved in smooth cypress?

Horace ridicules the Roman educational system and what he sees as a pervasive preoccupation with material goods. He also implies that Romans only learn arithmetic so that they can keep track of their finances and accumulate more wealth. Mathematics and greed go hand in hand, and the entire scene suggests that such practically minded individuals, obsessed with counting and coins, will never be able to compose poems able to rival those of the Greeks, who are greedy for nothing but the eternal *kleos* that comes from successful literary composition. The stylistic values that Horace espouses constantly though his entire body of work cannot coexist with an interest in mathematics and money. The scene then leads into Horace’s formulation of an ideal poetry that combines the *dulce* with what is truly *utile* (AP 333-46). The juxtaposition is telling. Of course, there is a subtle joke here—Horace manages to write a few elegant verses full of *longae rationes* and the cumbersome, morally distasteful vocabulary of the forum. But that is all the room the poet and his literary program have for mathematics.

I want to argue that Manilius recognizes and manipulates this basic Roman antipathy towards mathematical poetry. To some extent, imagining such an antipathy requires an argument from silence. Horace may denounce mathematical poetry, but no other texts seem to echo his claims. Nevertheless, no other texts engage in mathematical poetry either, with one significant exception that we will discuss below in section three. This seems a sufficient basis to conclude that, for whatever reason, Romans simply did not find mathematics and poetry to be compatible.¹⁶ Although I do not wish to suggest that Manilius actually reacts to the poetic works of writers such as Archimedes or Eratosthenes, the literary maneuvers that they perform and the ways in which they compose poetry in and through mathematics closely parallel Manilius' own strategies. As we will see, Manilius introduces yet another kind of Hellenistic literature to Rome.

The programmatic significance that Manilius attaches to his mathematical operations becomes clearly visible at the beginning of Book 4. There, the astrologer catalogues the ways in which each of the zodiacal signs controls the character traits and professional lives of those born under its influence. Here we learn that Gemini produces poets:

mollius e Geminis studium est et mitior aetas
 per varios cantus modulataque vocibus ora
 et gracilis calamos et nervis insita verba
 ingenitumque sonum: labor est etiam ipse voluptas.
 arma procul lituosque volunt tristemque senectam,
 otia et aeternam peragunt in amore iuventam. (4.152-7)

A softer pursuit and a gentler way of life comes from Gemini, through varied songs, mouths set to meter with voices, slender reeds, words that accompany strings and their

¹⁶ It may be that Horace or, rather, his persona simply disliked mathematics altogether. *Carm.* 1.28 suggests just this. There, the speaker laments the dead Archytas and remarks that his intellectual achievements now do him no good. He may have been a “measurer of the sea and the earth and the sand that lacks number” (*maris et terrae numeroque carentis harenae | mensorem*, 1.28.1-2), but these feats pale in comparison to true philosophical knowledge.

inborn sound: even work itself is a pleasure. They want arms and war trumpets and sad old age to be far away, they live a life of ease and eternal youth in love.

These figures constitute an ideal mixture of the bucolic shepherd, who sings to the accompaniment of a slender reed, and the elegiac lover, who writes a *recusatio* to the world of martial epic. By the beginning of the first century CE, these kinds of poet had become well-known clichés.

The following lines, however, present a rather different kind of poet, one who travels through the stars:

inveniunt et in astra vias numerisque modisque
 consummant orbem postque ipsos sidera linqunt:
 natura ingenio minor est perque omnia servit. (4.158-60)

They also discover paths to the stars and, with numbers and measurements, add up the world and then leave the stars behind them: nature is no match for their intellect and serves them through all things.

These are astrological poets.¹⁷ Instead of playing the pipe, such writers turn their attention to the heavens and perform various mathematical operations (*numerisque modisque* | *consummant orbem*). There is a significant ambiguity here—in a poetic context, *numerus* and *modus* ought to refer to rhythms and meters. In the proem to Book 1, for instance, Manilius declares that it is a pleasure to travel through the sky and then announces that it is even more pleasing “to render into meter, with Phoebus regulating the rhythm,” what he knows about the stars (*in numerum Phoebō modulante referre*, 1.19). So too in the methodological excursus of Book 2, Manilius describes himself as flying through the universe and as *fata*, | *Pieridum numeris etiam modulata, canenti*, “singing of the fates that have been put into meter by the rhythms of the Pierides” (2.766-7). It seems, then, that the astrological poets themselves are particularly well suited to

¹⁷ Kennedy 2011: 174-5 emphasizes this point and offers a complementary reading, although he does not compare these poets to those mentioned at 4.152-7.

their task precisely because the *numeri* and *modi* with which they carry out their calculations cannot be distinguished from the *numeri* and *modi* with which they compose their verses.¹⁸ Furthermore, as we will see repeatedly below and as Kennedy argues, Manilius presents the mathematical truths of the universe as physical entities or objects that exist in space and time independently of the human mind—he is a “mathematical realist”, and it is precisely his *numeri* and *modi* that can mediate between the reader and those celestial mathematical truths.¹⁹ This intimate connection between poetic form and the mathematical nature of the *mundus* gives the astrological poet an almost magical power. By “adding up” the contents of heaven or by “calculating” various astronomical values, the astrological poets actually “perfect” the world around them (*consummant orbem*), revealing its mathematical regularity while turning nature herself into their servant through the power of their predictions.²⁰ The combination of mathematics and poetry thereby constitutes their defining characteristic and figures their compositions as mathematical microcosms of the mathematical macrocosm that they are investigating. This combination also clearly sets the astrological poets in opposition to the bucolic and elegiac poets who waste their time on slender reeds and songs of love. The *modulata vocibus ora* that such figures possess have nothing to do with the higher form of

¹⁸ See Kennedy 2011: 174, who makes the same point. Volk 2002: 234-45 discusses the connections Manilius makes between the form and subject matter of his poem; cf. Volk 2009: 214-5 and Wilson 1985: 293. Note also the use of *modulus* and *modulor* in connection with Orpheus at 5.330 and 335. Scaliger, quoted by Housman 1903-30: 4.21, connects *numeri* with arithmetic and *modi* with geometry. From our perspective, such distinctions are unnecessary; mathematical astronomy in general and Manilius in particular use the theoretical tools and methods of both fields.

¹⁹ Kennedy 2011 considers Manilius’ mathematical realism at length and makes this particular point at p. 179. Habinek 2011 discusses the material nature of the Manilian cosmos as well.

²⁰ Trying to capture the nuances of *consummo*, Kennedy 2011: 174 says that Manilius’ mathematical poets “give a full *account* of the heavens”.

mathematical *modi* practiced by the astrological poets, and their *mollius studium* pales in comparison to the rigorous pursuit of those who deal with the computations and calculations of the heavens.

To a certain extent, Manilius' portrait of Gemini is traditional. Ancient sources regularly identify the twin figures of Gemini as Apollo and Hermes, the god of song and the *primus inventor* of astrology, respectively, and so frequently ascribe poetic and/or astrological interests to those born under their influence.²¹ What is surprising is the emphasis that Manilius places on mathematics and the way in which he uses the combination of mathematics and poetry to distinguish the work of the astrological poets from more traditional types of poetry. This constitutes a strategy that Manilius adopts elsewhere and applies to his own persona.²² At two key points in the poem, Manilius highlights his own use of mathematics and so sets himself in opposition to those who promote more traditional types of poetry and more traditional aesthetic canons.²³ In Book 4, for instance, the poet wonders “who would be able to relate so many numbers so many times under the law [i.e., of meter], to repeat so many degrees, to say so many sums, and, while on the same subject matter, to vary the appearance of his speech?” (*sed quis tot numeros totiens sub lege referre, | tot partes iterare queat, tot dicere summas, | perque paris*

²¹ See the numerous texts cited in Feraboli, Flores, and Scarcia 1996-2001: 2.329-31. Although Virgo regularly carries similar associations, Manilius' sketch makes those born under her influence natural philosophers (4.189-96).

²² Without mentioning mathematics, Volk 2002: 220 and 2009: 108 n.109 and 208 n.61 suggest that the Gemini portrait in some way constitutes a Manilian “self-portrait”; MacGregor 2004: 154 n.29 concludes that “Manilius seems to be revealing that he was born on May 28th”. For our purposes, however, it makes no difference whether the historical Manilius was in any sense “a Gemini”. Abry 1993b: 202 suggests that the Gemini portrait alludes to Germanicus, or whoever is responsible for that particular *Aratea*.

²³ Apropos of these two passages, Kennedy 2011: 175-6 observes that “Manilius... makes a point of the difficulty numbers present”; again, he considers this difficulty in light of Manilius' philosophical materialism and “mathematical realism”.

causas faciem mutare loquendi, 4. 431-3). The answer is clearly Manilius. We will return to this passage in greater detail, but for now we should note that Manilius proudly admits that “charm will be lacking” from his poetry (*gratia derit*, 4.434). In the opening lines of Book 3, the astrologer makes a similar point. There he lists a variety of mythological and historical themes that he will not handle. Instead, he will attempt something different:

at mihi per numeros ignotaque nomina rerum
 temporaque et varios casus momentaque mundi
 signorumque vices partesque in partibus ipsis
 luctandum est...
 impendas animum; nec dulcia carmina quaeras:
 ornari res ipsa negat contenta doceri. (3.31-4, 38-9)

But I must struggle through numbers and the unknown names of things and the seasons and the various fortunes and movements of the heavens and the successions of the signs and degrees in degrees themselves... You should devote your mind [to this task] and not expect sweet songs: the material itself refuses to be adorned, since it is satisfied with being taught.

Like one of the planets that “struggle” against the movements of the fixed stars (*adverso luctantia sidera mundo*, 1.259 and 670), Manilius must “struggle” through a series of difficult topics (*luctandum est*), producing poetry that will be anything but “sweet”. As recent critics have emphasized, this entire passage alludes to two well-known moments in the *DRN*, one where Lucretius reflects on the difficulty of presenting Greek material in Latin verse (1.136-9) and one where he characterizes his poetic medium as the honeyed cup that allows the reader to swallow his bitter teachings (1.936-50).²⁴ On both readings, Manilius distinguishes himself from Lucretius by insisting that the difficulty inherent in treating astrology surpasses the difficulty involved in expounding Epicurean physics to such an extent that Manilius is forced to give up any hope of rendering his poem sweet.²⁵ It is essential to notice, however, that the list of topics

²⁴ Volk 2002: 242 and Schindler 2000: 250, respectively.

against which Manilius must struggle begins and ends with mathematics, *numeri* and *partes*, and that his exposition of the *varios casus momentaque mundi | signorumque vices* throughout Book 3 will be extremely technical and highly mathematical. By way of comparison, Lucretius' treatment of similar themes in *DRN* 5, set within the random and accidental world of Epicurean physics, will look like "sweet songs". But if the poet who deals with *numeri* and *partes* sets himself in opposition to Lucretius, he also stands in stark contrast to all those who value literary *gratia* or attempt to compose *dulcia carmina*. That poetry should possess *gratia* and be *dulcis* forms a mainstay of Greco-Roman poetics, and *dulcis* in particular constitutes a virtual slogan for Latin poetry of the Late Republic and Early Empire, not least of all in Horace's anti-mathematical *Ars Poetica*.²⁶ Like the astrological poets born under the influence of Gemini, Manilius strenuously contrasts his mathematical aesthetics with traditional poetic values.

But Manilius does not always draw explicit attention to this contrast, and a key passage from Book 1 will suggest just how subtle Manilius' mathematical polemics can be. Like Horace, Aratus and the Latin Aratean tradition are more than a little disinterested in mathematics. Although neither Aratus nor his Latin imitators make much use of numbers, geometry does figure in their treatments of the celestial circles. I will argue that Manilius goes much further than they do and that the astrologer's enthusiasm for geometry encourages the reader to see a lack of mathematical rigor in the writings of the Aratean tradition. The most mathematically

²⁵ Thus Volk 2002: 242. I cannot agree with Schindler 2000: 250, who explains lines 3.38-9 as saying "der Lehrstoff selbst lehnt externen Schmuck ab... da er selbst schon ausreichende Schönheit besitzt". The point of line 38 is precisely that Manilius' material does *not* have any inherent "Schönheit".

²⁶ The importance connection between pleasure, or sweetness, and poetry was mentioned briefly in Chapter 1.2.

abstract passage in the *Phaenomena* concerns the size of the zodiac and its distance from the earth:

ὅσσον δ' ὀφθαλμοῖο βολῆς ἀποτείνεται αὐγῇ,
 ἐξάκις ἂν τόσση μιν ὑποδράμοι· αὐτὰρ ἐκάστη
 ἴση μετρηθεῖσα δύο περιτέμενεται ἄστρα.
 ζωιδίων δέ ἐ κύκλον ἐπίκλησιν καλέουσι. (*Phaen.* 541-4)

A beam as great as is stretched out from the glance of an eye would subtend it [*sc.* the zodiacal circle] six times: and each sixth, measured equally, cuts off two constellations. They call it by name the circle of the zodiac.

Aratus assumes that the earth is at the center of the zodiacal circle and that from the center of this circle the beam of the observer's eye radiates upwards to the top, traversing a distance equal to the circle's radius. What he states is that this distance subtends six equal arcs within the circle and that each of these six arcs contains two of the circle's twelve signs. Aratus does not explain the geometry behind this proposition. (One must understand, as the scholiasts do, that if a regular hexagon is inscribed within a circle, not only will each of its sides subtend 1/6 of the circle's circumference, but each side will also be equal to the circle's radius. Therefore, the distance traveled by the observer's eye from earth to heaven could also be said to subtend six equal portions of the circle's circumference or two zodiacal signs.)²⁷ Nor does Aratus draw attention to his mathematical maneuvering. Indeed, his mathematical image follows a comparison with craftsmen (*Phaen.* 529-33) and takes the same basic form as a non-technical description of the points at which the zodiac meets the horizon (*Phaen.* 534-40). Aratus simply explains the size of the circle and omits the geometry as much as possible.

²⁷ See Kidd 1997: 371-4. Euclid *Elem.* 4.15 provides the geometrical proof and concludes in the corollary that each side of the hexagon will be equal to the radius of the circle. Euclid, of course, engages in a purely abstract activity (εἰς τὸν δοθέντα κύκλον ἐξάγωνον ἰσόπλευρόν τε καὶ ἰσογώνιον ἐγγράψαι...), whereas Aratus works with a specific circle. This is the difference between geometry, in the ancient sense, and a discipline such as geodesy or astronomy.

It is important to realize that Hellenistic astronomy completely mathematicizes the heavens. Astronomers and mathematicians such as Autolycus, Euclid, and Aristarchus rely heavily on geometry and turn the heavens into a mathematical playground—Aratus emphatically refuses to do this.²⁸ A poem about the stars written by an Archimedes or Eratosthenes would have looked markedly different. In this regard, the *Aratea* of Cicero and Germanicus follow the *Phaenomena* closely, and their accounts of the zodiac do not provide any more geometry than Aratus' (cf. Cic. *Arat.* 313-9 and Germ. 526-30).²⁹ Aratus' poem achieved a remarkable degree of popularity at Rome, and the slender sophisticated style that he and his Latin imitators embody contains no room for mathematical complexities. In the *Astronomica*, however, Manilius adopts a fundamentally different approach. The main core of Book 1 follows the basic outline and even

²⁸ Cuomo 2001: 79-82 draws a similar contrast. The standard account of ancient mathematical astronomy is Neugebauer 1975. Evans 1998 provides a more accessible introduction for the non-specialist. Aratus' refusal to engage in mathematics is striking given that his most likely source, Eudoxus' *Phaenomena*, was almost certainly mathematical in nature; Kidd 1997: 15, for instance, concludes that "Eudoxus was probably the first to attempt a mathematical description of the celestial sphere". For Aratus' dependence on Eudoxus, see Hipparchus *Comm.* 1.2.17 and 1.10.13-5 with Kidd 1997: 175 and 348, *pace* Martin 1998: 1.lxxxvi-cxxiv, who argues that Hipparchus greatly misrepresents or even invents the relationship between the two works. Aratus, however, did write several other works concerned with astronomical phenomena (*SH* 86-90). One of these, the *Canon* (*SH* 90), treated the five planets and explained their movements through musical harmony (ἁρμονία τινὶ καὶ συμφωνίᾳ μουσικῇ τὰς κινήσεις αὐτῶν (sc. τῶν πλανήτων) λέγει γεγονέναι, *SH* 90 = Achill. *Isagoga* p. 42 Maass). The idea is Pythagorean and the work may have dealt with mathematics, although it is unclear whether Aratus composed it in verse or prose. Eratosthenes' *Hermes*, mentioned above, also dealt with the planets and musical harmony (fr. 13 Powell), and may have contained additional mathematics (cf. fr. 15-6 Powell).

²⁹ A lack of mathematics characterizes Latin literature's engagement with the stars more generally. Fantham 2011, for instance, offers a survey of Latin literary reflections on the stars; although numbers surface occasionally, there are no mathematical operations of which to speak. Cf. Soubiran 1979, who offers a broader survey of Roman astronomical knowledge and notes that, in contrast to the Greek world, at Rome "on serait bien en peine de citer le nom d'un astronome authentique" (p. 167). Like the Roman Aratean tradition, other Hellenistic *Phaenomena*, although extremely fragmentary, also seem disinterested in mathematics. See Alexander Aetolus fr. 20 Powell, Alexander Ephesius *SH* 19-22, Hegesianax *SH* 465-70, Hermippus *SH* 485-90, Sminthes *SH* 729-30, and ades. pap. *SH* 907-9.

relative proportions of Aratus' text—fixed stars (255-531), planets (532-8 + 805-8), and celestial circles (539-804), followed by a discussion of signs (809-926).³⁰ Manilius transfers the passage in question from the discussion of the zodiac proper (666-80) to the introductory account of the celestial circles (539-60; the lines occur at 552-6). This change in position helps establish the Aratean tradition as the formal model for his extensive account of the celestial circles, but also draws attention to certain differences in their respective approaches. Instead of considering how Manilius adapts the lines in question, I want to look closely at the way in which he prefaces them. The initial foray into celestial geometry does not rely on the reader's knowledge of hexagons:

nam quantum terris atque aequore signa recedunt,
tantum bina patent. quacumque inciditur orbis
per medium, pars efficitur tum tertia gyri
exiguo dirimens solidam discrimine summam.
summum igitur caelum bis bina refugit ab imo
astra, bis e senis ut sit pars tertia signis.
sed quia per medium est tellus suspensa profundum,
binis a summo signis discedit et imo. (1.544-51)

For as far as the signs withdraw from land and sea, so far do two signs extend. Wherever a circle is cut through the middle, then a third part of its circumference is produced, although it takes apart the full total by a tiny difference. Therefore the top of heaven flees from the bottom over a distance of twice two signs, so that out of the twice six signs it [*sc.* this distance] is a third part. But since the earth has been suspended through the middle of the depths, it departs from the top and bottom [*sc.* of heaven] by two signs.

Manilius begins with a basic proposition, the zodiacal signs are two signs' distant from the earth, which is again pictured as the center of the zodiacal circle (544-5). His geometrical "proof" falls into three parts. First, the diameter of a circle is equal to 1/3 of its circumference, minus a small

³⁰ That Manilius' discussion of comets as signs parallels the second half of the *Phaenomena*, the so-called *Diosemeiai*, has not received proper critical attention; I hope to discuss the issue in more detail elsewhere. Moreover, numerous linguistic parallels with Cicero's *Aratea* and the end of *Georgics* 1 make it plain that Manilius knew the Latin tradition and was thinking of his introductory book as a kind of *Aratea*. Romano 1979: 21-34, however, goes too far in restricting the influence of Aratus on *Astronomica* 1 to Manilius' treatment of the fixed stars.

amount (545-7). This represents the geometrical fact that the diameter of a circle is equal to its circumference divided by pi ($d = c/\pi$). Second, Manilius supposes $c = 12$ zodiacal signs, and $\pi = 3$, allowing him to conclude (*igitur*) that $d = 4$ zodiacal signs or $1/3$ of the total (548-9). Third, since the distance from the earth to the top or bottom of heaven is actually the radius of the circle, not its diameter, it follows that $r = 2$ zodiacal signs (550-1). This is precisely what the astrologer had set out to show. Manilius then measures the zodiac a second time, using the distance the beam of the eye travels from earth to heaven (552-6). By way of comparison, Aratus and the Aratean tradition look geometrically deficient. The true poet of the stars must expend all his mathematical energy on a particular problem.³¹

But Manilius does not allow his geometrical one-upmanship to pass by in silence. Before entering into his calculation, the astrologer emphatically highlights his numerical maneuver:

ipse autem quantum convexo mundus Olympo
 obtineat spatium et quantis bis sena ferantur
 finibus astra, docet ratio, cui nulla resistant
 claustra nec immensae moles caecive recessus;
 omnia succumbunt ipsum et penetrabile caelum. (1.539-43)

But how much space the heavens themselves possess in vaulted Olympus and in how great a territory the twice six signs are carried, calculation teaches, that which no bolts oppose nor huge masses or blind recesses; all things yield [to it] and the sky [can be] penetrated [by it].

Here, Manilius hymns the power of *ratio*. Intriguingly, poet's language echoes the opening of the *DRN*, where Lucretius employs similar terminology in his praise of Epicurus, the epic hero of atomistic "reason". There, Lucretius describes how Epicurus dared oppose the oppressive rule of

³¹ Abry 1993a: 197 well notes that, in the discussion of celestial circles to follow, "Manilius a considérablement modifié et complété l'enseignement d'Aratos" by including additional circles that Aratus omits and by attempting to offer scientific definitions for them. Soubiran 1979: 173 + nn.29-30 observes that an account of the four celestial circles was a popular commonplace in Latin literature, although the Aratean tradition omits the others; for these additional circles, he cites only Manilius, Hyginus, Martianus Capella, and Macrobius. Manilius' departure from Aratus' model will have been all the more conspicuous on this account.

religion (*primusque obsistere contra*, 1.66). The stories of the gods, the danger of thunderbolts, and the threatening sky itself only roused him to “desire to be the first to break through the close-set bolts of the doors of nature” (*effringere ut arta | naturae primus portarum claustra cupiret*, 1.70-1). Epicurus proved victorious and advanced far beyond the walls of our own universe, before returning in a veritable triumph with true knowledge that would make man equal to the sky (1.72-9). Like Lucretius’ Epicurus, Manilian *ratio* smashes through all barriers on its militaristic journey to heaven. Also like Lucretius’ Epicurus, Manilian *ratio* is a teacher. In fact, Lucretius himself actually uses the phrase *docet ratio* at *DRN* 3.161-2 (*haec eadem ratio naturam animi atque animai | corpoream docet esse*).³² But this Manilian *ratio* also differs strikingly from the *ratio* with which Lucretius associates his hero. Manilius redefines Lucretian “reason” as mathematical “calculation” or “computation”.³³ This maneuver subtly highlights the lack of mathematical thinking in Lucretius’ poem, and simultaneously establishes an important poetic model for the role that mathematics will play in the *Astronomica*. The poem will display the unstoppable power of mathematical knowledge, which will gain the eternal glory that comes from being the subject of epic song.³⁴

³² Cicero uses the phrase as well (*Div.* 1.129, 2.45, 2.91; *Fin.* 1.19; *ND* 1.46; *TD* 3.22, 23). Cf. Livy 22.39.10. Volk 2002: 198 + n.5 observes that Manilius rarely uses *doceo* of himself, and notes that he applies the verb to other entities, such as *ratio*.

³³ Kennedy 2011: 181-2 discusses the present passage, suggesting that *ratio* be rendered as “calculation” or “counting”, and then considers the various ways in which Manilian *ratio* allows the poet to transcend his physical boundaries. Moreover, Kennedy observes that “*Ratio* is commonly used in Latin, like *logos* in Greek, of counting, of keeping accounts, of totting up the figures, and this seems relevant to how Manilius uses the term” in general (p. 173).

³⁴ In an analysis of the end of Book 5, Schindler 2000: 240 observes that 5.732-2 contains a simile that implicitly compares the stars to the heroes of epic poetry. It is tempting to think of the stars, as well as *ratio* and the cosmic *deus*, as Manilius’ epic heroes throughout the poem.

Manilius, then, uses mathematics to engage in literary polemics in a way that resembles the activities of certain Hellenistic mathematicians. The results are twofold. On the one hand, the astrologer clearly distances himself from his literary predecessors. By configuring mathematics as a central component of his literary project, he refuses to conform to traditional stylistic norms and simultaneously suggests the superiority of his own composition. On the other hand, an intrinsic connection between mathematical astrology and poetry begins to emerge. Since the *numeri* and *modi* with which one performs astrological calculations cannot be distinguished from the *numeri* and *modi* through which one composes poetry, Manilius' own poem seems well poised to reveal the order or reason of the cosmos in a way that others cannot.

2. Complexity, Order, and Mathematical Knowledge

As we will see, Manilius implies that in order to ply his trade successfully and simultaneously to reveal the order or reason of the cosmos, any astrologer must be able to perform a variety of mathematical operations. The following analysis will consider three of these operations: the construction of *trigona* and *quadrata*, the division of the zodiacal signs into dodecatemories, and the computation of the horoscope. Although these passages all operate in slightly different ways, each one presents a variety of mathematical procedures through which the reader must navigate with the utmost care. It is my contention that the continual accumulation and evaluation of differing and sometimes competing mathematical tasks produce the impression of accuracy or reliability. As a result, mathematical skill becomes the guarantor of astrological knowledge. At the same time, I will argue that the superabundance of information and the multiplicity of mathematical operations create a dizzyingly complex and almost chaotic picture of the heavens,

rendering the student entirely dependent on the expert knowledge of the astrologer. Only Manilius' mathematical *rationes* can reveal the true order or reason that lie behind and unite this apparent cosmic confusion, namely, its own *ratio*. This maneuver allows Manilius to become a necessary intermediary between the student of astrology and the mathematics of the *mundus*.³⁵

Although Manilius regularly anthropomorphizes the signs and frequently alludes to or even relates traditional mythological narratives about the stars, his heavens are fundamentally mathematical.³⁶ After his initial description of the zodiac, the northern signs, and the southern signs (1.256-455), Manilius warns the reader not to look for actual bodies in the nighttime sky (*tu modo corporeis similis ne quaere figuras*, 1.458). Rather, the astrologer declares, “a line marks out the appearance, and [individual] fires answer [individual] fires; the middle is inferred from the edges and the rear from the top” (*linea designat species, atque ignibus ignes | respondent; media extremis atque ultima summis | creduntur*, 1.466-8).³⁷ Manilius' stars, like those of the Hellenistic mathematical astronomers, are geometrical—they are constructed out of points (*ignes*) and lines (*linea*), and the skilled mathematician can explore their properties and

³⁵ Volk 2002: 209-24 discusses Manilius' role as a medium between the student and the *mundus* from a variety of perspectives. This theme is connected with the idea that the cosmos itself voluntarily reveals itself to the poet; see Vallauri 1954: 142-51 on the Hermetic resonances of this idea. Romano 1978 discusses Manilius' appeals to his reader in general, and Neuburg 1993 treats the poet's addressees. Green 2011, however, argues that Manilius deliberately attempts to confuse his reader, thereby deconstructing the entire project of astrology. It will become clear that I do not agree with Green's argument; Manilius introduces complexity into his universe, but simultaneously reveals its order and regularity.

³⁶ For the potential problems raised by Manilius' anthropocentrism, see Volk 2011: 114-9 with further bibliography. Again, I agree with her assessment that the contradictions in the poem (e.g., anthropomorphized signs vs. signs as geometrical entities) are not intended to create a deliberate tension or to undermine the poem's intellectual framework (p. 108).

³⁷ Tr. Goold 1992, with modifications.

relationships according to fixed mathematical rules.³⁸ These rules play a prominent role in Book 2. Here, Manilius considers specific geometrical relationships between specific zodiacal signs and the powers that such signs wield over those on earth, beginning with an account of the regular polygons that can be inscribed within the zodiacal circle (2.270-692).³⁹ An inscribed equilateral triangle, for instance, will connect three signs, said to be in trine aspect, while an inscribed square will connect four signs, said to be in quartile aspect. Manilius' primary account of such *trigona* and *quadrata* runs from 2.270 to 357 and constitutes a central passage through which he makes the acquisition of a thorough understanding of geometry a necessary achievement for the student of astrology. We can see this in the way that Manilius characterizes and then manipulates the relationship between geometrical figures and the student who studies them.

The *trigona* and *quadrata* first appear as new topics about which the student needs to be informed: it is not enough to know the properties of the signs in isolation, since “they also change one’s fate through their agreements, and they delight in treaties and assist other signs according to their kind and position” (*consensu quoque fata movent et foedere gaudent | atque aliis alia succedunt sorte locoque*, 2.271-2). Here, Manilius begins to employ a string of social and political metaphors to describe the relationships between the heavenly bodies (e.g., *consensus* and *foedus*). Although such metaphors are traditional, the astrologer immediately begins to reconfigure the social and political ties that exist up above, which literally produce the

³⁸ Montanari Caldini 1993 connects the larger passage from which these lines come with Aratus 370-85, and suggests that Manilius' language reflects ancient visual representations of the signs.

³⁹ Scaliger, quoted by Housman 1903-30: 2.44, notes that the discussions of tutelage and *melothesia* (2.433-52 and 2.453-65, respectively) seem out of place and may have originally stood somewhere else. Housman adds that 2.466 would follow naturally from 2.432.

social and political ties that exist down below, in terms of geometry.⁴⁰ The treaties of heaven, and so too those of earth, are to be understood through the mathematical knowledge of the geometer:

circulus ut dextro signorum clauditur orbe,
 in tris aequalis discurrit linea ductus
 inque vicem extremis iungit se finibus ipsa,
 et, quaecumque ferit, dicuntur signa trigona,
 in tria partitus quod ter cadit angulus astra
 quae divisa manent ternis distantia signis. (2.273-8)

Where the circle of the signs is completed on its right hand wheel, a line extends in three equal strokes and joins itself, in turn, at its furthest limits, and, whatever signs it strikes, [these] are said to be *trigona*, because the angle is dealt out three times and falls on three constellations that are divided and remain separated by three signs each.

Although Manilius offers two concrete examples, Aries–Leo–Sagittarius and Taurus–Virgo–Capricorn (2.279-83), his primary account of *trigona* remains abstract. This sense of abstraction is heightened by the use of etymology. When he explains that “the *angulus* is dealt out three times and falls on three constellations”, Manilius alludes to the etymology of the Greek *τρίγωνος*, which is composed of “three” (*τρι-*) and “angle” (*γωνία*). This move also suggests the more familiar and less astrological *triangulum*, which allows the mathematically literate reader to conceptualize the *trigonum* with ease.⁴¹ Despite this abstraction, however, the *trigona* are

⁴⁰ Lloyd 1966: 210-32 analyzes these kinds of social metaphors in the context of early Greek cosmology.

⁴¹ Only once does Manilius refer to the *trigona* as *triangula* (*triangula signa*, 2.282). Although Cicero *Div.* 2.89 simply translates the term when he says that the Chaldaeans call the figures *triangula*, Germanicus fr. 6 suggests that there may have been debate about the issue: *quidni te divite lingua, | Graecia, praecurram potiusque triangula dicam?*, “why should I not pass you by, Greece, with your rich language, and call them *triangula* instead?” The point is that the poet prefers the Latin *triangulum* to the Greek *τρίγωνον*. *Quidni te* is Housman’s emendation for *cur*. As Gain 1976: 139 notes, “if *cur* is right, the author must have written something meaning ‘this is the reason’ or ‘there is a good reason’ before it”; he connects the passage with Tiberius’ objection to the excessive use of Greek words in Latin (Suet. *Tib.* 71). Note, however, that Germanicus’ tone contrasts markedly with that of Lucretius, who laments the *egestas* of Latin in

physical realities that exist in the heavens, just as the social and political metaphors suggest.⁴²

The *linea*, for instance, extends itself and meets itself again in perfect harmony without any assistance from the astrological geometrician. Moreover, since the three equal *ductus* that compose each triangle are by definition lines “produced by drawing” (*OLD* s.v. 4), the triangle seems literally to draw itself through the stars. Manilius accounts for the *quadrata* in a similar way. Thus, a few lines later, he explains that a line made according to the *norma*, or carpenter’s square, literally traces out each of the figure’s four angles (*designat normalis virgula sedes*, 2.289). The polygons of the zodiac can be understood completely because they have made themselves according to basic mathematical principles.

And yet, the astrologer himself must actually know how to construct, or rather reconstruct, such shapes down below on earth. Since there is plenty of room for error on the student’s part, Manilius devotes a passage in excess of 60 lines (2.297-357) to differentiating the correct method of construction from the incorrect method. As a general rule,

quadrati si forte voles effingere formam,
aut trinis paribus facies cum membra trigoni,
hic poscit quintam partem centesima summa,
illic amittit decimam. sic convenit ordo. (2.333-6)

If perchance you wish to fashion the shape of a *quadratum*, or when you make limbs of a *trigonum* with three equal sides, in the latter case the sum of 100 demands a fifth part [*sc.* of itself, i.e., 100 + 20], in the former case it loses a tenth [*sc.* of itself, i.e., 100 – 10].

Thus the sequence harmonizes.

The key idea is straightforward: each side of the square must cover 90 degrees of the zodiac, while each side of the triangle must cover 120 degrees of the zodiac. This means that in forming such *trigona* or *quadrata*, one must always connect a specific degree of each sign to a specific

comparison to Greek (1.136-45 and 1.830-3). Unlike Lucretius, who must use words like *homoeomeria*, Germanicus boasts of his ability to turn difficult Greek into natural Latin.

⁴² Again, cf. Kennedy 2011 on Manilius’ mathematical realism.

degree of another, since if one measures by whole signs, which are 30 degrees in length, the size of the angles will be off (cf. 2.312, the process will go awry *si signum signo, non pars a parte notetur*). Take the *trigonum* Aries–Leo–Sagittarius. If one measures inclusively from the first degree of Aries to the last degree of Leo, the arc will come to five signs or 150 degrees. So, too,, if one measures from the end of Aries to the start of Leo, the arc will come to three signs or 90 degrees. Since each side must cover 120 degrees exactly to produce an equilateral triangle, the one method goes too far, the other not far enough.

Two points need to be made. On the one hand, although the principle is straightforward, there is a dramatic tension in this passage between the actions of the second person singular “you” (*voles, facies*) and the requirements of geometry (*hic poscit... summa, | illic amittit... sic convenit ordo*). In order for the stars to come together in harmonious combinations, “you”, the astrologer, must understand and follow certain mathematical rules that exist independently. Ignorance of these rules leads to disastrous consequences. If the astrologer follows one of the incorrect methods, “he will be deceived” (*falsus erit, 2.302*), the native “will not be able to feel the powers of the *trigonum*” (*sentire trigoni | non poterunt vires, 2.304-305*), the signs themselves will “fight with the numbers” (*numerisque repugnant, 2.306*), the individual degrees “will cause the shipwreck” of the sign (*naufragium facient partes unius in ipsis, 2.330*).⁴³ By treating the point at such length and setting the stakes so high, Manilius underscores the importance of geometrical precision and the necessity of calculating correctly. This is the first point in the poem at which he expressly warns the student that there is a right way and a wrong way to perform a certain task, and it is significant that this task is mathematical.⁴⁴ On the other

⁴³ Schindler 2000: 251 briefly connects the use of *naufragium* with Lucr. 2.549-66.

hand, Manilius' exertion tacitly enhances the value of his own expertise. The rules of geometry are absolute and nature herself has endowed the geometrical configurations of the *trigona* and *quadrata* with certain powers: "to these [configurations] nature has given contracts with common law and reciprocal goodwill and shared rights of friendship" (*his natura dedit communi foedera lege | inque vicem affectus et mutua iura favoris*, 2.340-1). Nevertheless, access to these rules and an ability to interpret their powers depend on the knowledge that Manilius provides. The student is implicitly indebted to his teacher, and Manilius himself subtly begins to emerge as an intermediary between the mathematics of the *mundus* and the activities of his student. As we will see, Manilius deploys a similar strategy in his treatment of dodecatemories and the computation of the horoscope. The key difference will be that in each case Manilius describes alternate methods of calculation. Instead of making sure that the student does not stray from the rules of the only correct procedure, the astrologer weaves an increasingly complex web of possible mathematical tasks.

When he concludes his analysis of celestial geometry, Manilius turns to dodecatemories (2.693-737). Here, each sign is divided into twelve segments and each segment is then allotted to the various signs, starting with the sign in question. Manilius draws attention to the mathematical calculation involved, however simple it may be, and notes that the name *dodecatemorium* suggests the underlying principle:

nam, cum tricenas per partes sidera constant,
 rursus bis senis numerus diducitur omnis;
 ipsa igitur ratio binas in partibus esse
 dimidiasque docet partes. (2.696-9)

⁴⁴ Romano 1978: 116-7 lists these types of address to the reader, although she does not cite this passage. Volk 2002: 198-9 notes that one only becomes aware of the presence of an addressee at 1.194, which is reminiscent of the late appearance of Aratus' addressee.

For, since the signs consist of thirty degrees, every number is again divided by twice six; therefore calculation itself teaches that there are two and a half degrees in the divisions [i.e., of each sign].

With Manilius' help, *ratio* itself again teaches the basic point, and thirty degrees divided by twelve signs does indeed come to two and a half degrees per *dodecatemorium*. Two basic points need to be made about the treatment that follows. First, instead of enumerating the particular allotments, the astrologer explains the principle according to which all the dodecatemories are distributed. After the first sign claims its first dodecatemory, the other signs proceed according to their number and in order (*cetera pro numero ducunt ex ordine partes*, 2.717) until the final calculation is given to the final sign (*ultima et extremis ratio conceditur astris*, 2.718) and the sum itself is then filled up (*summa repletur*, 2.720). The astrologer starts with a mathematical equation and then creates an impression of regularity and precision that make it unnecessary to dwell on particular details. Second, the regularity and order of the mathematical operation mirror the actual or physical regularity and order of the cosmos. The following claim about the origin of the dodecatemories is significant: “the founder of the universe allotted [the dodecatemories]... to the shining stars so that the constellations might be united by alternating lots... and by their mixtures concord might rule the body [i.e., the universe]” (*quae mundi conditor ille | attribuit... fulgentibus astris | ut sociata forent alterna sidera sorte... quorum mixturis regeret concordia corpus*, 2.701-705). When he engages in the mathematical task of distributing the signs to their proper dodecatemories, the student of astrology reproduces the original creative activity of the *mundi conditor*. This kind of mathematical operation reveals and recreates the divine order of the cosmos.

Manilius, however, complicates this picture. After his initial account of dodecatemories, the astrologer reveals that there is a second *ratio* related to the same doctrine:

nec genus est unum, ratio nec prodita simplex,
 pluribus inque modis verum natura locavit
 diduxitque vias voluitque per omnia quaeri.
 haec quoque comperta est ratio sub nomine eodem. (2.722-5)

Nor is there one way, nor has a simple calculation been handed down, but nature has placed the truth in many methods and separated the paths and wished to be sought through all things. The following calculation too has been discovered under the same heading.

Nature herself has created manifold *rationes* and established numerous *modi*, a fact that forces the poet to perform more and more mathematical operations in order to arrive at the truth. This new *ratio* will allow the student to determine what dodecatemory of a sign any given planet occupies, provided he knows in what degree of that sign the planet stands. Take the Moon as an example. Whatever degree of a sign the Moon occupies, multiply this by twelve, since there are twelve zodiacal signs, and then allot each sign thirty degrees in order: “where the signs give up, the Moon will hold the dodecatemory of this sign” (*in quo destituent, eius tum Luna tenebit | dodecatemorium signi*, 2.735-36). If the Moon occupies the 9th degree of Aries, then $9 \times 12 = 108$, and 108 has room for 3 whole divisions of 30 degrees before the signs “give up” (i.e., $108 / 30 = 3.6$). The Moon therefore occupies the fourth dodecatemory, that of Cancer. As various critics have seen, this new *ratio* does not really differ from the original *ratio*. Without this new method of calculation, the student would have divided 9 degrees by 2.5 degrees per dodecatemory and would have arrived at 3.6 *dodecatemoria*, which would still have placed the Moon in the dodecatemory of Cancer. I want to make three points, all of which show that the complete redundancy of the second *ratio* constitutes Manilius’ main point. First, Manilius’ mathematical expertise matches nature’s variety and his ability to arrive at the truth in more than one way enhances his prestige. The accumulation of *rationes* and *modi* advertises the poet’s skill and continues to associate his persona ever more closely with mathematics. Second, the

astrologer guarantees the accuracy of his results. If both operations lead to the same conclusions, the reader knows that he has performed the arithmetic correctly. Third, the presence of two different *rationes* creates an impression of complexity, and this impression of complexity is then harmonized or resolved when both *rationes* yield the exact same numbers. The simultaneous multiplicity and identity of mathematical tasks prompts the reader to contemplate the fundamental coherence and regularity that lie behind the seemingly disparate and chaotic expanses of heaven.⁴⁵

Turning to Book 3, we find that Manilius performs a similar maneuver on a much larger scale and in much greater depth. For nearly half of the book (3.203-509), Manilius furnishes the reader with four mathematical *rationes* that allow him to calculate the horoscope or the ascendant, namely, the degree of the ecliptic that rises above the horizon at the time of birth. Since the location of the horoscope determines the position of the other cardinal points, as well as the Lot of Fortune, careful measurement is essential, and numerous sources underscore the difficulty of accurately determining the horoscope.⁴⁶ Accordingly, Manilius sets the stakes quite high. Determining the correct means of calculation requires an agile mind (*forsitan et quaeras, agili rem corde notandam, | qua ratione queas... exprimere... horoscopton*, 3.203-205), and if the *ratio* itself is not “fine” or “exact”, “the foundations of the system collapse and the sequence does not harmonize” (*quod nisi subtili visum ratione tenetur, | fundamenta ruunt artis nec*

⁴⁵ Cf. the treatment of decans (4.294-407), discussed below in section 3. There, Manilius declares that: “the means is not brief, nor does heaven love shortcuts” (*nec brevis est usus nec amat compendia caelum*, 4.305). The principle is the same. Moreover, the language has clear stylistic implications—just as Manilius refuses to write *dulcia carmina*, so too he declines to characterize his work as small or brief.

⁴⁶ Abry 1998: 307 n.9 notes that “la plupart des astrologues” reflects on the difficulty of the task. In addition, at p. 307 n.10, she observes that “Les difficultés d’établir cet instant de façon précise sont l’un des arguments le plus souvent invoqués par les adversaires de l’astrologie”, and cites Sex. Emp. *Ad math.* 5.27, 52, and 65-70 and Hippol. *Haer.* 4.14.

consonat ordo, 3.207-208). Despite the significance of the operation, not all astrologers adopted a mathematical approach. Sextus Empiricus, for example, describes a scenario in which a man, who sits beside the woman in labor, uses a gong to signify the exact moment of birth to a Chaldaean astrologer who sits on the roof gazing at the stars (*Ad math.* 5.68). Sextus may intend the scene to appear comical, but it vividly suggests the great lengths to which people might go so as to ascertain the horoscope with precision.⁴⁷ Cicero, however, provides a slightly more germane point of comparison. In the *De divinatione*, Cicero's character criticizes the Chaldaeans for trying to make such determinations with their eyes, the most fallible of senses; instead, he argues, they ought to rely on and be familiar with the *ratio mathematicorum*, "the method" or "the calculations of the mathematicians".⁴⁸ As we will see, Manilius adopts this basic attitude, utilizing the *ratio mathematicorum* rather than the feeble and deceptive powers of observation.⁴⁹ In order to determine the horoscope, the astrologer must know the rate at which the individual signs rise and be able to isolate the *minumum punctum* (3.215) or individual "degree" (*pars*, 3.216) of each sign's rising. This value is calculated within two vast and complex systems, the 24 hours of the day, each with their 60 minutes, and the 720 stades of the zodiacal circle. After a brief exhortation, the poet puts forward four competing methods of calculation, the first of

⁴⁷ For rooftop astrologers, cf. Suet. *Aug.* 94.12, where Augustus and Agrippa ascend the *pergula* of Theogenes the *mathematicus*. As Kennedy 2011: 169 notes, "Presumably this [*pergula*] is an upper room or roof-terrace from which Theogenes can make precise observations of the stars which will provide the basis of his calculations".

⁴⁸ Cic. *Div.* 2.91: *etenim cum ut ipsi dicunt ortus nascentium luna moderetur, eaque animadvertant et notent sidera natalicia Chaldaei quaecumque lunae iuncta videantur, oculorum fallacissimo sensu iudicant ea quae ratione atque animo videre debebant. docet enim ratio mathematicorum, quam istis notam esse oportebat, quanta humilitate luna feratur terram paene contingens...* Note, again, the combination of *ratio* and *docet*.

⁴⁹ Although it seems unlikely that this passage influenced Manilius, Volk 2009: 232-4 considers the possibility that Manilius knew the second book of the *De natura deorum*, and it is possible that he may have known other prose works by Cicero.

which, the so-called *vulgata ratio*, he immediately invalidates. As numerous critics have pointed out, the three remaining methods do not produce consistent results. In fact, the fourth method actually yields values that are identical to those of the repudiated *vulgata ratio*. In a moment of anguish and despair, Housman bitterly and condescendingly laments: “Alas, alas! This alternative method of yours, my poor Marcus, is none other than the vulgar method which in 218-24 you said you knew, and which in 225-46 you exposed as false. The wolf, to whom in his proper shape you denied admittance, has come back disguised as your mother the goose, and her gosling has opened the door to him”.⁵⁰ Based on this apparently sad state of affairs, Brind’Amour actually concludes that the entire passage, from 483 to 509, must be spurious.⁵¹ Critics have also puzzled over certain superfluous details. For instance, in addition to calculating the rising times of the signs in both hours and stades, Manilius provides their setting times, numbers that are irrelevant to the computation of the horoscope. It would be a mistake, then, to assume that Manilius aims merely for internal consistency or straightforward exposition here. Instead of faulting the poet for contradictions or providing unnecessary details, I want to look at the programmatic ways in which he describes various *rationes* and associates himself with their execution. Although he repeatedly complicates the mathematics of the heavens, the astrologer simultaneously showcases his knowledge and transforms his expertise into an indispensable tool upon which the student must constantly rely in order to obtain sure results.⁵²

⁵⁰ Housman 1903-30: 3.xxi.

⁵¹ Brind’Amour 1983.

⁵² Volk 2009: 91 suggests that perhaps “Manilius has crafted this section not so much to impart actual useful knowledge as to show off his astronomical sophistication and ability to convey complicated scientific matters in the medium of the hexameter”.

Manilius begins by going on the attack. At the outset, he declares that he is aware of a common method of calculation (*nec me vulgatae rationis praeterit ordo*, 3.218) that operates under the faulty assumption that each sign rises during the course of two hours and through thirty degrees of the ecliptic. In rejecting this *vulgata ratio*, Manilius insists on the vast complexity of the *mundus* and dwells upon the fact that the length of the day and the length of a natural hour continually change throughout the year. The limits of day are so “dissimilar” and “varied” (*in tam dissimili spatio variisque dierum | umbrarumque modis*, 3.235-6) that no one could possibly believe that all the signs rise “under one equal law of heaven” (*pari mundi sub lege*, 3.237). So, too, the measure of an hour is utterly “uncertain” (*incerta est horae mensura*, 3.238), even though six signs always remain above and six signs always remain below the horizon. The constantly changing multiplicity of heaven renders the simplistic and straightforward *vulgata ratio* utterly ineffective and makes the student keenly aware of the need for Manilius’ more nuanced method of calculation. Next, Manilius insists that the student who searches after the truth of the matter must engage in precise measurement (*lucem noctemque paris dimensus in horas*, 3.248) and establish an exact standard (*regula... exacta*, 3.250) by which the natural hour can be measured. This standard will be found at the equinoxes, when day and night both last 12 equal hours, which together produce “the sum established by nature” (*natura condita summa*, 3.262). The astrologer then describes the rising and setting times of the signs based on this standard in both hours and stades for the latitude of the Nile, where he mistakenly claims that the ratio of day to night or night to day at the solstices will be 9 ½ equinoctial hours to 14 ½ equinoctial hours.⁵³ The poet, however, only gives the numerical values for one particular sign, Aries:

⁵³ These values are accurate for the latitude of Rhodes, not Alexandria or the Nile. Abry 1993a

nobile Lanigeri sidus, quod cuncta sequuntur,
dena quarter stadia exoriens duplicataque ducit
cum cadit, atque horam surgens eiusque trientem
occupat, occiduus geminat. (3.278-81)

As it rises, the distinguished constellation of the Ram, which all follow, leads forth four times ten stades and double that number when it falls, and it seizes one hour and a third of that as it rises and doubles it as it sets.

Manilius describes Aries in action, giving the stades through which he rises and sets and then the hours through which he rises and sets. The entire sequence is one of order and balance—the setting values exactly double the rising values (*duplicata, geminat*). This sense of harmony within complexity increases as the poet gives the rule by which to calculate the rising and setting values from Aries up to Libra: each sign gains eight stades while rising and loses the same number (*totidem*, 3.283) while setting, and each sign gains 16 minutes while rising and loses an equal amount (*pari momento*, 3.287) while setting. Although the regularity of the sequence is apparent, Manilius describes it obliquely. The signs, for instance, do not gain a mere 16 minutes in rising. Rather, “the hour grows through the individual signs by a new fourth [i.e., $1/4 \times 60$ minutes = 15 minutes] and there is introduced a third portion of a fifth portion of it [i.e., $1/3 \times 1/5 = 1/15$, and $1/15 \times 15$ minutes = 1 minute]” (*hora novo crescit per singula signa quadrante | tertiaque e quinta pars parte inducitur eius*, 3.284-5). The poet thereby balances order and complexity, creating balance out of apparent chaos. From Libra back to Aries the sense of order is so strong that it is no longer necessary to calculate the actual numbers: through as many stades and hours as Aries rises, through so many does Libra set (*quot... tot*, 3.290-1), and through as

discusses the problem and suggests that the inconsistencies or inaccuracies “seraient alors un argument en faveur d’une composition rapide ou fragmentaire du poème” (p. 210). More intriguing, however, is her treatment of the way that Manilius emphasizes the correspondence between the number of mouths of the Nile and the number of the planets, thereby turning the Nile into a microcosm of the heavens, one of Manilius’ favorite tropes. As we will see below, order and regularity may count for more than numerical accuracy.

many stades and hours as Aries sets, through so many does Libra rise (*in tantum*, 3.293). Manilius' subtle *ratio* perceives the fundamental order behind the numerical chaos of the risings and settings of the signs.

The astrologer then reflects on the mathematical operations he has performed and the service he has rendered his student. The following passage is key:

haec ubi constiterint vigilantibus condita mente
iam facile est tibi, quod quandoque horoscopet astrum,
noscere, cum liceat certis surgentia signa
ducere temporibus propriasque ascribere in horas,
partibus ut ratio signo ducatur ab illo,
in quo Phoebus erit, quarum mihi reddita summa est. (3.295-300)

When these things stand fixed and are settled in your wakeful mind, then it is easy for you to know what sign is horoscoping and when, since it is possible to compute the signs that are rising at sure times and to assign them to their proper hours so that from that sign in which Phoebus will be the calculation may be made in the divisions of which I have rendered the sum.

Here, Manilius emerges as an explicit intermediary between the mathematics of the *mundus* and the student of astrology. Initially, the poet encourages “you”, the student, and emphasizes the second person singular: it will be easy for you (*tibi*) to compute the horoscope and carry out the required calculation. By the end, however, all the weight falls squarely on Manilius: it will be easy for you only because “I”, the poet (*mihi*), have performed the arduous task of tallying the hours and stades through which the signs rise and set. Manilius' technical ability in rendering sums now seems to demand recognition and to rival that of nature, the agent who originally established them (*natura condita summa*). Although the student will continue the poet's mathematical work, his task will be a lighter one thanks to Manilius' undeniable expertise.

But the astrologer does not stop here. These values and the ease with which they allow the student to calculate the horoscoping degree of the ecliptic are only valid at the latitude of the Nile. After describing the problem in great detail, the poet issues another programmatic

statement and renews his exhortation to exactitude in computing the rising and setting times of the individual signs,

partibus ut prendi possint orientia certis,
 ne falsus dubia ratione horoscopus erret.
 atque hoc in totum certa sub lege sequendum est,
 singula quod nequeunt, per tot distantia motus,
 temporibus numerisque suis exacta referri. (3.388-92)

so that, as they rise, they may be able to be apprehended with sure divisions, lest the horoscope be falsified and err due to a doubtful calculation. And this is to be pursued in general under a sure law, since the individual signs differ through so many movements and are unable to be reported precisely in their times and numbers.

Careful computation once again promises to save the astrologer from deception or error and to lead to certain knowledge. And yet, the signs are so varied that the requisite values cannot actually be computed with total accuracy. In such circumstances, the general values of a sure law (*certa sub lege*) constitute the only viable means to obtaining reliable results (cf. 3.440-2). The student therefore remains entirely indebted to Manilius: “let him pick up the path that I have laid down, and let each one follow it for himself and advance through his own tracks, and let him owe his art to me” (*a me sumat iter positum, sibi quisque sequatur | perque suos tendat gressus, mihi debeat artem*, 3.393-94).⁵⁴ Again, there is a transition here. Manilius’ calculations lay the groundwork that the student will later use when he himself needs to calculate a horoscope. But Manilius himself stands at both the beginning and the end of this progression, literally encircling the student (*me... sibi quisque... mihi*) with his mathematical authority. Although the poet elsewhere declares that he will be indebted to no one (*nulli vatum debebimus orsa*, 2.57), the student does not possess that sort of intellectual autonomy. He must obtain his mathematics from Manilius.

⁵⁴ Volk 2002: 225-34 discusses the metaphor of the “heavenly journey”, and considers the present passage from that perspective (p. 231). For the heavenly journey motif in general, see Landolfi 1999.

We have now seen Manilius present a series of methods of calculations. The initial *ratio* was invalid, the second *ratio* required qualification, and the third *ratio* now claims to be universal. As Manilius accumulates and evaluates one *ratio* after another, the text progresses from error and limitation towards certainty and comprehensiveness. At the same time, Manilius' rhetoric begins to change. The first two methods are entirely descriptive and rely on indicative statements of fact. The *vulgata ratio*, for instance, simply "assigns two hours to the signs as they rise and arranges equal constellations in matching spaces" (*binas tribuit signis surgentibus horas | et paribus spatiis aequalia digerit astra*, 3.219-20). The third method, however, employs exhortations and commands. Wherever the student of astrology happens to find himself:

deducat proprias noctemque diemque per horas,
 maxima sub Cancro minimis quae cingitur umbris;
 et sextam summae, fuerit quae forte, diurnae
 vicino tribuat post Cancri templa Leoni;
 at quae nocturnis fuerit mensura tenebris
 in totidem partes simili ratione secanda est,
 ut, quantum una ferat, tantum tribuatur ad ortus
 temporis averso nascenti sidere Tauro.
 has inter quasque accipiet Nemeius horas
 quod discrimen erit, per tris id divide partes... (3.396-405)

let him calculate night and day in their own hours [on the day] that is greatest and is girded by the smallest shadows under Cancer [i.e., at the summer solstice]; and let him assign a sixth of the sum of daylight, whatever it chances to be, to neighboring Leo, who comes after Cancer's temple; but the measure that the nighttime darkness possesses is to be cut up into as many parts by a similar calculation, so that, as much as one part bears, so much may be assigned to the rising time of Taurus, the sign that is born backward. Whatever difference there is between these hours and those that the Nemean receives, divide this into three parts...

Since this method of calculation is universal, Manilius cannot simply record the rates at which the signs rise and set. Instead, he produces a complex mathematical formula. By plugging in the local values for the length of day and night at the summer solstice, the student will automatically be led through a series of computations that produce accurate results. Manilius is firmly in

control, dictating the tasks that the student must perform, and allows the regularity of the cosmos to emerge through the universal applicability of one mathematical formula. In what follows, however, the poet complicates the situation. After his account of the third *ratio*, Manilius teaches the reader how to calculate the rate at which the hours of daylight increase between the winter and the summer solstices (3.443-82). The astrologer does not clearly explain the relationship between this passage and the third *ratio*, and various critics characterize it as an irrelevant digression. Following this lesson, the poet expounds a fourth *ratio* for determining the horoscope (3.483-509). As I have already mentioned, numerous critics highlight the fact that this method of calculation produces results that are identical with those of the discredited *vulgata ratio*, and they regularly lament the poet's ignorance or incompetence. I suggest, however, that both passages—that is, the account of daylight hours and the fourth *ratio*—contribute to the poet's strategy of accumulating as many *rationes* as possible. Through these texts, Manilius complicates the heavens, then demonstrates the order that actually unifies the *mundus*, and simultaneously makes the student ever more dependent on his mathematical persona.

First, although Manilius does not explain the relationship between the third *ratio* and the calculation of the rate of increase of daylight hours, Brind'Amour shows that this passage actually conveys necessary information and therefore should not be viewed as a digression.⁵⁵ The passage also fits in with Manilius' larger project. Significantly, the lesson itself constitutes yet another *ratio*: “the calculation is great and must be taught quickly” (*magna est ratio breviterque docenda*, 3.447). Since the calculation itself only helps the astrologer ascertain the

⁵⁵ Brind'Amour 1983: 146 notes: “In order to convert sundial hours into equinoctial hours (a step needed to find the Ascendant), one has to know the ratio between the length of a particular day and the average 12 equinoctial-hour day”; he then explains the procedure. Abry 2006 offers a complementary account of the third *ratio* and the discussion of daylight hours, and concludes that “L'*excursus* s'inscrit donc dans la cohérence scientifique du poème” (p. 159).

horoscope within another mathematical system, the entire passage describes a sort of sub-*ratio* or *ratio* within a *ratio*. Once again, however, the poet begins by creating a sense of imbalance or irregularity. The student must learn the following lesson because the length of the winter months “do not advance through all the signs with equal steps” (*neque enim paribus per sidera cuncta | procedunt [sc. hiberni menses] gradibus*, 3.444-5). Nothing is *par*, and the opening lines of the actual calculation reinforce the initial impression of disorder:

principio capienda tibi est mensura diei
 quam minimam Capricornus agit, noctisque per horas
 quam summam; quodque a iusto superaverit umbris,
 perdiderint luces, eius pars tertia signo
 tradenda est medio semper, qua sorte retenta
 dimidio vincat primum, vincatur et ipsum
 extremo: totum in partes ita digere tempus. (3.448-54)

First, you must seize the measurement in hours of the shortest day that Capricorn spends, and of the greatest night; and what falls to the shadows in excess of the full amount and what light loses of it, a third part of this must always be given to the middle sign; when this portion is retained, let it surpass the first sign by one half, and let itself be surpassed by the last sign: arrange the whole time into portions in this way.

The procedure is far from clear. Although he will give values for the series of constellations Capricorn–Aquarius–Pisces, the poet does not plug his numbers into this formula, and the reader is left to work out the original values on his own. Manilius tells us that Capricorn receives an additional $\frac{1}{2}$ hour of daylight, Aquarius an additional 1 hour of daylight, and Pisces an additional $1\frac{1}{2}$ hours of daylight.⁵⁶ This brings us to the vernal equinox and the series Aries–Taurus–

⁵⁶ Manilius assumes that Capricorn’s shortest day lasts 9 hours and his longest night 15 hours. The “full amount” is the number of hours of daylight or nighttime at the equinoxes, which is 12. Accordingly, the longest night receives 3 hours in excess of this amount ($15 - 12 = 3$), and the shortest day loses 3 hours ($12 - 9 = 3$). One-third of 3 comes to 1, which is then given to the middle sign, Aquarius. Aquarius surpasses the first sign by one half, so Capricorn receives $\frac{1}{2}$, and the last sign surpasses Aquarius by the same amount, so Pisces receives $1\frac{1}{2}$. Therefore, Capricorn increases from 9 hours of daylight to $9\frac{1}{2}$, Aquarius increases from $9\frac{1}{2}$ hours of daylight to $10\frac{1}{2}$, and Pisces increases from $10\frac{1}{2}$ hours of daylight to 12. See Goold 1997: lxxv-lxxvi and 196-201.

Gemini. Instead of providing another formula, the poet tells us that these signs gain the same number of daylight hours as the previous three signs, only in reverse order. Accordingly, Aries gains 1½ hours, Taurus 1 hour, and Gemini ½ hour: “in this way the last sign answers the first [i.e., Gemini and Capricorn receive ½], and similarly for those signs that shine next to these [i.e., Taurus and Aquarius receive 1], and the middle signs are assessed with equal strength [i.e., Aries and Pisces receive 1½]” (*sic ultima primis | respondent, pariterque, illis quae proxima fulgent, | et media aequatis censentur viribus astro*, 3.474-6). The entire progression centers on balance and harmony—sign answers sign, and the tally yields equal values. At the outset, nothing was *par*. Now we find a regular sequence that structures the movement from winter to summer solstice chiastically (½ – 1 – 1½ vs. 1½ – 1 – ½). The chiasmic principle also applies to the solstices themselves, and the movement from summer back to winter solstice exactly parallels the initial sequence. After reiterating that this is the rate at which the hours of daylight increase from winter to summer solstice, Manilius remarks: “then the night equals the winter solstice’s day [i.e., 9 hours], the long day [equals] the time of night [i.e., 15 hours], and it returns on a course similar to that by which it had grown” (*tumque diem brumae nox aequat, tempora nocti | longa dies, similique redit, quam creverat, actu*, 3.481-2). One daylight value equals the other’s nighttime value, and one nighttime value echoes to the other’s daylight value. Similarly, the rate at which daylight decreases corresponds precisely to the rate at which it increases, and the poet refuses to list the values for or even name the series Cancer–Leo–Virgo (i.e., from 15 hours of daylight to 12) and Libra–Scorpio–Sagittarius (i.e., from 12 hours of daylight 9). The entire passage depends on one obscure formula, and that formula reveals an increasing level of balance—the first grouping of signs requires a good deal of exposition, the second grouping requires less than the first, and the second half of the year requires no detailed explanation at all.

Manilius' *ratio* within a *ratio* reaffirms the poet's ability to handle complex mathematical operations deftly, and further suggests the profound mathematical order that structures both the poem and the cosmos.

Second, from our perspective, it does not matter whether or not Manilius recognizes that the fourth *ratio* yields the same results as the *vulgata ratio*. The poet treats this mathematical task as a yet one more universally applicable means of calculating the horoscope. Manilius begins by adopting a tone of absolute certainty: "the following path will also be able to guide [you] to the rising sign" (*illa etiam poterit nascens via ducere at astrum*, 3.483). Like the preceding *ratio*, this method will also (*etiam*) give accurate results. Next, Manilius confidently orders and directs the student. The calculations will be valid: "for you will behold what hour of daylight it is... and you will call this number back to itself, multiplying it ten times, with five sums, however, added to the same number on top of that... and when this number stands firm, remember to join as well those degrees that remain for Phoebus throughout the signs" (*nam quota sit lucis... aspicias, atque hunc numerum revocabis in ipsum | multilicans decies, adiectis insuper eidem | quinque tamen summis... hic ubi constiterit numerus, coniungere et illas, | quae superent Phoebus partes per signa, memento*, 3.485-91). Unlike the other *rationes*, the poet does not give a concrete example, and the mathematical formula remains entirely abstract, piling addition upon addition and multiplication upon multiplication. The complexity reinforces the student's dependence on the teacher, and the abstraction underscores the formula's universal nature, implying its undeniable accuracy. After giving the formula for a daylight nativity, Manilius then gives the formula for a nighttime birth. Unfortunately, the text suffers a lacuna here, but the nighttime procedure follows the same steps as its daytime counterpart. Once again, Manilius creates order out of complexity, and chaotic multiplications suggest a fundamental

sense of balance. Finally, the entire discussion of the horoscope ends with a brief exhortation to careful observation and precise computation, reemphasizing the importance of ascertaining the horoscope for determining the four cardinal points (*horoscopos, occasus, medium caelum, imum caelum*). Although it brings the passage as a whole to an end, this exhortation attaches closely to the fourth *ratio* and figures it as the capstone or culmination of the preceding narrative: “in this way will you have to seek among the fast stars the birth point of the heavens and the horoscope with its sure rising, so that, when precise accuracy stands under the first cardinal point (= *horoscopos*), the peak of highest heaven may not deceive you [= *medium caelum*], nor the swift settings [of the signs = *occasus*], and the foundations may stand at the bottom [= *imum caelum*]” (*sic erit ipse tibi rapidis quaerendus in astris | natalis mundi certoque horoscopos ortu, ut, cum exacta fides steterit sub cardine primo, | fallere non possint summi fastigia caeli, | non celeres obitus, stent fundamenta sub imo* 3.503-7). These lines encourage the reader to see that the entire narrative in general and the fourth method of calculation in particular (*sic*) produce sure results (*exacta fides*) and keep the astrologer free from deception (*fallere non possint summi fastigia caeli*). By accumulating as many *rationes* as possible, Manilius is able to guarantee the validity of his enterprise, serve as an indispensable mediator between the student and the complex mathematics of the *mundus*, and simultaneously to reveal the true order and regularity of the cosmos.⁵⁷

There is a certain irony in Manilius’ extensive treatment of the horoscope and its multiple *rationes*. As Volk notes, Manilius’ narrative does not fit with ancient astrological practice and does not even allow the reader to cast a nativity: “Not only would an astrological practitioner at

⁵⁷ In a discussion of critical attitudes towards the problem of the fourth *ratio*, Volk 2011: 106 concludes that “some self-contradictions [in the *Astronomica*] simply cannot be interpreted”, that is, made meaningful; I hope to have offered one plausible interpretation.

Manilius' time not rely on his own observations and calculations—he would instead consult astronomical tables to find out the rising times of the signs—but the poet's methods for determining the *horoscopus* presuppose prior knowledge of other phenomena... without telling us how to acquire it. Similarly, even assuming that we might be able to calculate the ascendant following the poet's instructions, this would not enable us to construct the circle of lots... or to make up a meaningful birth chart: for this, we would need to know where all the planets are positioned".⁵⁸ Manilius' *rationes* serve no useful purpose and simply ignore the realities of practicing astrologers. Instead, they radically mathematicize or astronomize the heavens and further contribute to the development of Manilius' own mathematical persona. In fact, although it contains no relevant information for actual astrologers, the entire passage can be usefully compared to a number of astronomical works that utilize mathematical tools to determine astral rising times or the rate at which daylight increases.⁵⁹ Furthermore, I suggest that the simultaneous irrelevance and extraordinary length of Manilius' *rationes* begin to make the *Astronomica* as a whole appear less practical or utilitarian and thereby encourage the reader to reconsider what he is actually doing when he carries out these mathematical tasks. We will return to this point in greater detail in section 3, but for now I want to emphasize that there is an important sense in which Manilius implicitly equates his impractical *rationes* with another kind of *ratio*. Throughout the poem, the astrologer repeatedly refers to the regularity and order of the cosmos, and emphasizes the divine *ratio* that pervades and at times appears to control it. Early in Book 1, for instance, the poet declares: "the divine power of a spirit directs [the workings of

⁵⁸ Volk 2009: 91. Baccani 1992: 77-9 briefly explains how ancient astrologers actually determined the horoscope.

⁵⁹ Neugebauer 1975: 2.706-36 and Evans 1998: 95-9 discuss ancient mathematical approaches to these problems. Cf. Abry 1998 and 2006, who considers Manilius' place within these mathematical traditions.

the *mundus*], and with sacred movements god breathes harmoniously with it and governs it through silent *ratio*” (*vis animae divina regit, sacroque meatu | conspirat deus et tacita ratione gubernat*, 1.250-1). Similarly, later in the same book, Manilius avers: “nothing in so great a mass [i.e., the *mundus*] is more marvelous than its *ratio* and the fact that all things obey sure laws” (*nec quicquam in tanta magis est mirabile mole | quam ratio et certis quod legibus omnia parent*, 1.479-80). Both passages connect *ratio* with the regular and smooth functioning of the universe, and they have clear Stoicizing undertones.⁶⁰ More importantly, the calculation-*ratio*, examined in detail above, and the reason- or order-*ratio*, on display here, actually imply one another. The universe is a well-ordered and predictable place precisely because it obeys unchanging mathematical laws. At the same time, performing mathematical calculations reveals the pervasive order and regularity of the cosmos. By showing the student how to carry out a variety of mathematical *rationes*, Manilius allows the student to grasp the fundamental *ratio* that pervades the *mundus* as a whole.⁶¹

Manilius, then, successfully communicates to his reader the mathematics of the *mundus*. The construction of *trigona* and *quadrata*, the lesson of the dodecatemories, and the calculation of the horoscope all characterize mathematical skill as an absolute necessity for anyone who wishes to study the stars and to arrive at sure conclusions about the world. At the same time, these passages present an increasingly complex picture of the mathematical operations that

⁶⁰ For Manilius and Stoicism, see MacGregor 2005, Volk 2009: 226-34, Habinek 2011, and Mann 2011.

⁶¹ This perspective suggests that the basic conclusions of Green 2011 are misguided. As noted above, he discusses a number of passages where Manilius complicates his lessons by adding unexpected information and argues that this maneuver is designed to confuse and ultimately to fool or mislead the reader so that, in the end, he learns nothing.

astrology involves. The reader requires Manilius' help to cope with the multiplicity of the cosmos and to uncover the order with which it operates.

3. Addition, Enumeration, and the Supremacy of Mathematical Astrology

These calculations and computations are not the only mathematical procedures that create cosmic complexity or chaos and simultaneously reveal the order of the universe. Addition and enumeration perform similar maneuvers, and I will argue that through these processes Manilius subtly shifts the context within which mathematical knowledge operates away from the zodiacal signs towards more intangible entities. This change in perspective enhances the value or significance of mathematical skill and leads to the very heart of the popular conception of astrology.

Ascertaining the length of life allotted to an individual constitutes one of the major functions of astrology, at least as represented in non-astrological sources. Horace, for instance, famously urges Leuconoe not to inquire into "the limit" of one's life and to refrain from consulting the numbers of the Babylonians (*Carm.* 1.11), and in 11 CE Augustus issued an imperial edict forbidding the consultation of astrologers in private and any inquiries into anyone's death whatsoever.⁶² Manilius, however, embraces the idea:

altera nunc ratio, quae summam continet aevi,
reddenda est, quot quaeque annos dare signa ferantur.
quae tibi, cum finem vitae per sidera quaeris,
respicienda manet ratio numerisque notanda. (3.563-6)

Now another calculation must be rendered, one that contains the sum of one's lifetime, namely, how many years each of the signs are said to give. When you seek the limit of

⁶² For the edict, see Cass. Dio 56.25.5. Cramer 1954: 248-81 discusses its history.

life through the stars, this calculation awaits you and is to be heeded and noted with its numbers.

In what follows, Manilius enumerates the various years that are in store for the native according to two schemes, one that assigns a definite number to the individual signs and one that attributes a definite number based on the position of the Moon relative to each of the twelve temples. Although each scheme follows a regular progression, Manilius does not make this explicit. If he had followed the pattern of calculations and computations discussed above, he would simply have given the value associated with one sign or temple and then stated a general rule by which to calculate the remaining values. Instead, Manilius takes the time to list all the individual sums. As a result, the entire passage remains very concrete and appears quite literally to add up the *summa aevi*.⁶³

So much is reasonable enough—an *aevum* can be easily counted and said to have a *summa*. This passage, however, plays with the notion that life itself, or rather an individual person, also may have a different kind of *summa*, and Manilius develops this idea elsewhere. In the discussion of lots or *sortes*, for instance, the poet notes that the eleventh lot “always governs our sum and strength” (*summam nostri semper viresque gubernat*, 3.139). Here, *summa nostri* refers to life in general or “our whole being” (Goold), and Manilius proceeds to explain that the eleventh lot also controls sickness and health. But there is a sense in which the individual is indeed a “sum” that the astrologer will attempt to add it up. So too in his introduction to the system of lots, Manilius explains that nature herself “distributed the whole census of man through the stars in a sure order” (*totumque hominis per sidera census | ordine sub certo duxit*, 3.72-3). Like *summa nostri*, the phrase *hominis census* implies an ability to add up or count an

⁶³ For Manilius’ numbers here, see Abry 1998: 318-9.

individual person in a way that has nothing to do with life expectancy.⁶⁴ This conception of man goes hand in hand with the idea that fate itself represents one long series of elements that the knowing astrologer can count. Thus Manilius can say the following of the zodiacal signs: “to these nature gave control, and to each one she dedicated their proper functions and through them all ordained the sum so that the calculation of fate might be drawn from everywhere to one whole” (*his regimen natura dedit, propriasque sacravit | unicuique vices sanxitque per omnia summam, | undique uti fati ratio traheretur in unum*, 3.64-6). From the *summa* of individuals, Manilius moves to the *summa* of human affairs or even the totality of the *mundus* itself, a vast sum that nature herself has established for the explicit purpose of making possible the tabulation or calculation of fate. The phrase *fati ratio* establishes an intimate connection between counting and destiny, and Manilius underscores this connection later when he refers to “the entire sum of fortune” (*in quibus [sc. aspects of human affairs] omnis erit fortunae condita summa*, 3.88). Taken as a whole, these passages clearly suggest that both fate and human life are collections of discrete entities and that either collection can be broken down into its constituent elements for counting and comprehension. Although the task seems virtually impossible, Manilius wholeheartedly embraces the idea and applies all his arithmetical ingenuity to tallying up these almost infinite series.

Two passages from *Astronomica* 4 take the theme of impossible addition or enumeration in a different but related direction, the discussion of decans and the tabulation of the *partes damnandae*. The decans provide another means of dividing up the zodiac—each sign is divided into three sections of ten degrees and each section is then allotted to a particular sign. Manilius discusses the doctrine and then lists the various signs that occupy the various decans of all the

⁶⁴ For the different uses of *census* in Manilius, see Glauthier 2011 and Kennedy 2011.

zodiacal constellations (4.294-407). Predictably, this procedure turns out to be insufficient (*nec satis est*, 4.409). The poet then launches into the enumeration of the *partes damnandae* (4.408-501) and cites by name the individual degrees of each sign that are “sterile” (4.413 and 498), coming eventually to a grand total of 102 specified degrees. Instead of looking at the numbers, however, I want to emphasize that both passages expressly apply the poet’s powers of addition and enumeration to god and equate his mathematical sums with an exposition or demonstration of the all-pervading *deus*.

Before beginning to list the *partes damnandae*, Manilius reflects on the difficulty of the task: “but who would be able to relate so many numbers so many times under the law [i.e., of meter], to repeat so many degrees, to say so many sums, and, while on the same subject matter, to vary the appearance of his speech?” (*sed quis tot numeros totiens sub lege referre, | tot partes iterare queat, tot dicere summas, | perque paris causas faciem mutare loquendi*, 4.431-3) As we have already seen, the answer is Manilius himself, and we can note that, once again, the poet’s need to handle mathematical material trumps conventional aesthetic demands. Even though the rendition of numbers threatens to become monotonous, the astrological poet steadfastly refuses to compose traditional *dulcia carmina*:

sed mihi per carmen fatalia iura ferenti
et sacros caeli motus ad iussa loquendum est,
nec fingenda datur, tantum monstranda figura.
ostendisse deum nimis est. (4.436-9)

But I must speak according to my orders, carrying through song the laws of fate and the sacred motions of heaven, nor is the configuration given [to me] to be fashioned, but only to be pointed out. It is more than enough to have shown god.

This entire passage equates the revelation of *deus* with the composition of mathematical poetry, defined in and through its continual enumeration of *numeri*, *partes*, and *summae*. The mathematical truths that Manilius explores exist in the real world—they are not inventions or

fabrications (*nec fingenda*), but are realities to be transmitted by the poet to his readership (*monstranda*).⁶⁵ At the same time, these mathematical realities simply are god (*deus*), and to reveal the one implicitly means revealing the other (*monstranda figura = ostendisse deum*). Manilius makes the same point less emphatically in his prefatory remarks to the discussion of decans. There, he notes that “heaven does not love shortcuts” (*nec amat compendia caelum*, 4.305), a nod to the potentially tedious enumeration to follow, and declares that the student’s fog of misunderstanding must be thoroughly dispelled: “which darkness you must put to flight not with your eyes, but with your deep-reaching mind, and you must note god deep down, not on the surface” (*quae tibi non oculis, alta sed mente fuganda est | caligo, penitusque deus, non fronte, notandus*, 4.308-309).⁶⁶ The list of decans follows immediately upon the exhortation to note or mark god and clearly answers its stirring call. At the conclusion of this enumeration, the poet again characterizes his subject matter in this way. When the student complains of the difficulty of the task, Manilius replies “what you seek is god” (*quod quaeris, deus est*, 4.390). The seemingly endless sums that make up the *partes damnandae* and the decans thereby contribute directly to a task of the utmost significance. If he can master the arithmetic, the student will have computed the ultimate sum, and Manilius confidently shows him the way.⁶⁷

The arithmetic involved in calculating god needs to be read from three perspectives, two philosophical and one literary. First of all, the progression from the *summa* of an individual or

⁶⁵ Kennedy 2011: 175-6, on 4.436-8, discusses the contrast between *fingenda* and *monstranda* in connection with Manilius’ mathematical realism.

⁶⁶ Cf. Schindler 2000: 249-50, who compares the language with that of Lucretius.

⁶⁷ Volk 2009: 101-2, 210-11 connects the prefatory remarks to the *partes damnandae* and the decans with the rejection of *dulcia carmina* and *gratia*, but does not single out the importance of mathematics in either passage. Green 2011: 127-8, noting the successive accumulation of astrological tasks from 4.122 to 584, uses the entire passage as part of his argument that Manilius intends to confuse his reader. Again, I adopt a fundamentally different interpretation.

the *summa* of fate as a whole to the addition and enumeration of god does not constitute an impossible philosophical leap. From a Stoicizing perspective, *fatum* and *deus* are interchangeable terms. Seneca, for example, declares that one may call Jupiter *fatum*, *providentia*, *natura*, or *mundus* (*NQ* 2.45), and speaks of philosophical inquiry as a process of “measuring god” (*sciam omnia angusta esse mensus deum*, *NQ* 1 pr. 17). *Ratio*, as the equivalent of the Stoic *logos*, can also represent the same constellation of ideas, and if god can be configured as *ratio*, there is no reason why one should not attempt to calculate him. To some, the task may seem like insanity, and someone such as Pliny, whose moralizing outlook always keeps one eye on man’s ethical limits, can declare: “it is madness that certain people have dared to purse with their minds and to publish the measurement [of the *mundus*]” (*furor est mensuram eius [sc. mundi] animo quosdam agitasse atque prodere ausos*, 2.3). But Manilius happily sets out to do just this, and it is significant that elsewhere in the poem he suggests that his true subject matter is in fact god. In the lengthy prologue to Book 2, for instance, the poet dramatically announces: “I will sing god, who exercises his power through the silent mind of nature and is poured into heaven and earth and the sea” (*canam tacita naturae mente potentem | infusumque deum caelo terrisque fretoque*, 2.60-1). By joining this sort of rhetoric with the work’s pervasive interest in mathematics, the analyses of decans and *partes damnandae* figure the composition of mathematical poetry as a fundamentally religious exercise. This idea needs to be applied to the mathematical operations of the work as a whole—indeed, to perform the mathematical tasks through which Manilius defines and advertises his persona constitutes a virtual calling.⁶⁸

⁶⁸ Volk 2009: 211-15 discusses Manilius’ “sacralization” of poetry, that is, “the presentation... of the poet’s activity and of his work in religious, positively spiritual, terms” (p. 211); she connects this with the poet’s self-presentation as a medium and/or *vates*. Cf. Volk 2002: 198-224.

This intense combination of mathematics and religion suggests another philosophical tradition that may provide an even more significant intellectual context for understanding Manilius, namely, the Platonic and/or Pythagorean tradition.⁶⁹ We know that Manilius was familiar with a variety of Pythagorean ideas, including the music of the spheres and quite possibly the *tetraktys*.⁷⁰ The part of this tradition that matters for us, however, is the attempt to explain the cosmos as a whole and the heavens in particular through numbers. According to Aristotle, the Pythagoreans see numbers everywhere: “indeed, since all other things appeared to have modeled their entire nature after numbers, and since numbers appeared to be the first things of the whole of nature, [the so-called Pythagoreans] supposed that the principles of numbers were the principles of all the things that are, and that the whole of heaven was harmony and number” (ἐπεὶ δὴ τὰ μὲν ἄλλα τοῖς ἀριθμοῖς ἐφαίνετο τὴν φύσιν ἀφωμοιῶσθαι πᾶσαν, οἱ δ’ ἀριθμοὶ πάσης τῆς φύσεως πρῶτοι, τὰ τῶν ἀριθμῶν στοιχεῖα τῶν ὄντων στοιχεῖα πάντων ὑπέλαβον [sc. οἱ καλούμενοι Πυθαγόρειοι] εἶναι, καὶ τὸν ὅλον οὐρανὸν ἀρμονίαν εἶναι καὶ ἀριθμόν, *Metaph.* A5. 985b32 – 986a3 = DK 58 B 4). It is difficult to tell to what extent Aristotle shapes the views of the Pythagoreans in question. Surely they did not represent numbers as *στοιχεῖα*—this is Aristotle’s terminology and needs to be read within his own project of ostensibly describing and then polemically refuting the views of early Greek philosophers.⁷¹

⁶⁹ It is basically impossible to determine what Pythagoras himself actually taught and what the early Pythagoreans professed or did. Plato’s engagement with and manipulation of early Pythagoreanism radically influenced subsequent conceptions; as a result, later accounts of Pythagoreanism are unreliable. Here, I am concerned simply with what might have appeared “Pythagorean” in Manilius’ day; Volk 2009: 243 adopts the same basic position. For the problem in general, see Burkert 1972: 15-83 and Kahn 2001: 1-4.

⁷⁰ For Pythagoreanism in Manilius, see MacGregor 2004: 154-5 and especially 2005, and Volk 2009: 242-6.

⁷¹ See Burkert 1972: 28-52 on Aristotle’s treatment of the Pythagoreans.

But the notion that numbers pervade, unite, and actually constitute the world fits well with Manilius' own intellectual outlook and also finds expression in other heavily Pythagorean texts. In Plato's *Timaeus*, for instance, the world soul is composed of numbers, and the demiurge constructs the four elementary bodies out of right triangles, which then combine to produce the five regular solids.⁷² This can be read in the context of the Pythagorean *quadrivium*, which closely associated geometry and astronomy. Such an association is implied a fragment of Archytas of Tarentum, where Archytas praises mathematical learning and singles out the achievements of astronomy and geometry for special praise (DK 47 B 1).⁷³ From this perspective, one thinks of the geometrical shapes that populate Manilius' cosmos and the mathematical nature of the *deus* or *natura* that creates them and endows them with their respective powers. The pseudo-Platonic *Epinomis* offers another highly suggestive point of comparison:⁷⁴

δοῦναι δὲ ἅμα καὶ ἀριθμὸν ἡμεῖς γε ὄντως αὐτὸν φαμεν, ἔτι δὲ καὶ δώσειν, ἐάν τις θέλη συνακολουθεῖν. ἐάν γὰρ ἴη τις ἐπὶ θεωρίαν ὀρθὴν τὴν τοῦδε, εἴτε κόσμον εἴτε Ὀλυμπον εἴτε οὐρανὸν ἐν ἡδονῇ τῷ λέγειν, λεγέτω μὲν, ἀκολουθεῖτω δὲ ὅπῃ ποικίλλων αὐτὸν καὶ τὰ ἐν αὐτῷ στρέφων ἄστρα πάσας διεξόδους ὥρας τε καὶ τροφὴν πᾶσιν παρέχεται. καὶ τὴν ἄλλην δὲ οὖν φρόνησιν, ὡς φαῖμεν ἄν, σὺν ἀριθμῷ παντί, καὶ τᾶλλ' ἀγαθὰ· τοῦτο δὲ μέγιστον, ἐάν τις τὴν ἀριθμῶν αὐτοῦ δόσιν δεξάμενος ἐπεξέλθῃ πᾶσαν τὴν περίοδον.
(*Epin.* 977a – b)

At the same time, we at least say that [Uranus] truly gave [us] number as well, and will actually continue to give it, if one is willing to follow him. For if anyone proceeds to investigate him correctly—whether it is pleasing to call him *cosmos* or *olympos* or *ouranos*—let him call him [as he likes], but let him follow the way in which, by

⁷² For brief a brief account of Pythagoreanism and the *Timaeus*, see Kahn 2001: 51-62.

⁷³ The text comes from Porphyry (*In Ptol. Harm.* p. 56 Düring). The *quadrivium* divided mathematics into the study of number or quantity (τὸ ποσόν) and magnitude (τὸ πηλίκον). The former was subdivided into arithmetic and music, the latter into geometry and sphaeric, i.e., astronomy. See Thomas 1939-41: 4-5, Burkert 1972: 420-2, and Kahn 2001: 40.

⁷⁴ For Pythagoreanism and the *Epinomis*, see, e.g., Burkert 1972: 365-6. Tarán 1975: 235-7 notes several parallels between the passage quoted here and the *Timaeus*.

decorating himself and causing all the stars that are in himself to turn through all their orbits, he brings about for all the seasons and nourishment. And, as we would say, [he also brings about] the rest of intelligence, together with the whole of number, and all that is good. But this is the greatest [good], if one receives his gift of numbers and then proceeds to examine the whole revolution [of the heavens].

Like Manilius, the author of the *Epinomis* identifies god with the heavens and with numbers. Moreover, both authors equate the mathematical study of the heavens with the study of god and promote this kind of study above all else—in the case of Manilius, this point will become even clearer in the discussion below. It is not necessary to suppose that Manilius knew the *Epinomis*, the *Timaeus*, or any other extant Pythagoreanizing work, and we do not need to identify any specific source text. Pythagoreanism had always figured prominently in Roman political and intellectual history—as we saw in Chapter 1.2, Numa was supposed to have encountered Pythagoras personally. More significantly, however, Roman interest in Pythagoreanism appears to have undergone a revival during the Late Republic. Cicero’s *Somnium Scipionis*, for instance, shows clear Pythagorean influence. Moreover, Cicero himself translated the *Timaeus*, in the preface to which he states that Nigidius Figulus effected a reengagement with Pythagorean *disciplina* at Rome (*Tim.* 1). Similarly, Varro celebrated the number seven in a fashion reminiscent of Pythagorean number theory (Gell. *NA* 3.10), and Pliny even reports that the great polymath was buried “in the Pythagorean manner” (*Pythagorio modo*, 35.160). Manilius’ presentation of mathematics, astronomy, and divinity clearly fits into this tradition.⁷⁵

When we turn to the literary tradition, we need to note that the process of addition and enumeration involved in counting god appears to represent an infinite or never-ending task, and

⁷⁵ Kahn 2001: 86–93 gives a brief overview of the Pythagorean tradition at Rome; he also discusses Pythagorean influences on Quintus Sextius and the so-called Sextians in the first century CE. Later in that century, Balbus’ *Expositio et ratio omnium formarum* provides another intriguing Latin parallel for Manilius. There, Balbus characterizes mathematical calculation as sacred to gods and as a divinity in its own right, and then compares completing a mathematical treatise to fulfilling religious vows.

that this idea of infinity has strong poetic resonances. I suggest that Manilius associates himself and his poem with an endless process of enumeration and calculation precisely to distinguish himself further from his literary predecessors and contemporaries. At the end of the *Astronomica*, Manilius considers the different magnitudes of the stars and observes that the dimmest magnitude contains the greatest number of heavenly bodies.⁷⁶ On a night when the brighter luminaries lie concealed below the horizon,

tum conferta licet caeli fulgentia templa
 cernere seminibus minimis totumque micare
 stipatum stellis mundum nec cedere summa
 floribus aut siccae curvum per litus harenae,
 sed, quot eant semper nascentes aequore fluctus,
 quot delapsa cadant foliorum milia silvis,
 amplius hoc ignes numero volitare per orbem. (5.726-7, 729-33)⁷⁷

Then it is possible to see gleaming the quarters of heaven, packed and shining with the smallest seeds, and the whole firmament, filled with stars, [and to see that they] do not yield in their sum to the flowers or to the dry sand along the curved shore, but, as many waves as always are born on the sea and go forth, as many thousands of leaves as drop and fall in the forests, more than this in number are the fires that fly through the heavens.

Manilius here combines several proverbial images for that which exceeds numeration—the stars in the sky, the sand on the shore, the leaves that fall from the trees.⁷⁸ Since they are unsurpassed in their *summa* and second to none in their *numerus*, the stars actually outstrip all other images of the uncountable. The *mundus*, then, is infinite and infinitely complex, “that which neither lengthy time increases nor old age diminishes” (*quem neque longa dies auget minuitque*

⁷⁶ The text ends somewhat abruptly and some critics consider either that the poem is incomplete or that the original ending has been lost. For the possibility of one or more lost books, see Volk 2009: 120 n.138; she considers the external evidence inconclusive. In the absence of more compelling evidence, I see no reason to suppose that we do not have the end of the poem as Manilius left it.

⁷⁷ Note that 5.728 = 1.42. Editors since Scaliger have assigned the line to Book 1.

⁷⁸ McCartney 1960 provides a useful catalogue of such images.

senectus, 1.519), and while he does not literally count the heavenly bodies, Manilius still has an unending series of mathematical operations to perform as he attempts to add up the sum of the *deus*. This image of an infinite computation, however, carries serious polemical weight. Although recent critics have discussed this particular passage in light of other literary texts that deploy similar imagery, I want to emphasize that Latin poetry regularly connects itself with the infinite and uncountable.⁷⁹ I will consider three examples.

First, Catullus urges Lesbia to give him thousands upon hundreds upon thousands of kisses: “then, when we have made many thousands, we will confuse the accounts, so that we may not know [the sum], and no evil person may be able to envy us, when he knows that there are so many kisses” (*dein, cum milia multa fecerimus, | conturbabimus illa, ne sciamus, | aut ne quis malus invidere possit, | cum tantum sciat esse basiorum*, 5.10-13). Catullus’ persona embraces the idea that his love with Lesbia should be infinite and uncountable, even to the lovers themselves, and they will defiantly add confusion to the numbers. The poet’s love and, implicitly, the poetry through which we encounter and experience that love are fundamentally unknowable—nobody will be able to quantify and so know or understand their affection. This maneuver allows Catullus to define his persona, his relationship, and his poetic project in opposition to more practically minded Romans who like to count their money in the forum.⁸⁰

Second, the connection between the uncountable and poetic production becomes less ambiguous in later writers, and Horace provides an instructive example. We have already seen that Horace refuses to combine poetry, which should be pleasing and edifying, with arithmetic, which is materialistic and greedy. Like Catullus, Horace adopts the mathematically uncountable as a

⁷⁹ Schindler 2000: 234-42 and Volk 2009: 109 n.113 discuss the passage in light of texts that use similar imagery.

⁸⁰ Catullus notoriously exploits the language of the forum. See Ross 1969.

symbol of his own literary achievement. At the end of *Carm.* 3, the poet proudly declares that his composition is of such quality “that neither the consuming rain, nor furious Aquilo may be able to tear them down, nor the countless series of years and the flight of time” (*quod non imber edax, non Aquilo impotens | possit diruere aut innumerabilis | annorum series aut fuga temporum*, 3.30.3-5). Horace presents his compositions as an everlasting monument that will continue to be read indefinitely—to be able to count or quantify the extent of its duration would be to deny it total perfection. Third, Virgil transfers this kind of rhetoric from the sphere of personal poetry to that of civic poetry. In the *Aeneid*, Virgil’s Jupiter can easily count the number of years that will elapse from the start of Aeneas’ war with the Italians to the birth of Romulus and Remus (1.261-77). Aeneas will control Latium for three summers and three winters, Ascanius will rule for thirty years and move to Alba Longa, and Hector’s race will dominate Alba Longa for 300 years after that, until Ilia gives birth to twin sons: “for these, I establish neither limits for their affairs nor time: I have given them empire without end” (*his ego nec metas rerum nec tempora pono: | imperium sine fine dedi*, 1.78-9). Jupiter makes an important distinction here. Rome’s prehistory can be computed and enumerated, but Rome itself cannot undergo this kind of mathematical operation. The city will live forever, and Virgil’s poem repeatedly foresees, but does not attempt to quantify or comprehend, that infinite expanse of time. Their fates are intimately connected and equally uncountable or limitless. When we come back to Manilius, we find that the astrologer plays with this tradition in a striking way. Manilius does not simply say that his poem will extend indefinitely in time or evade all attempts at quantification. Instead, Manilius makes the very subject and contents of his work an infinite series of additions, multiplications, and measurements. By calculating and enumerating the ostensibly uncountable multiplicity that is the *mundus* and the *deus*, the poem itself continually

enacts or performs its own limitlessness and thereby figures its own mathematical complexity as a mirror or microcosm of the mathematical complexity of the cosmos. Manilius and his poem will live forever precisely because the reader will always need to compute another sum. Their infinity coincides with the infinity of god, rather than that of Rome, and so surpasses all other claims to the uncountable.⁸¹

The task of measuring god, then, represents the ultimate symbol of the power and significance of Manilius' mathematical astrology. By comparison with the sure and profound knowledge of god and the *mundus* that Manilius' mathematical astrology offers, other fields of inquiry into the natural world appear ordinary and uninteresting. Although the poet does not discuss such fields in depth, Manilius explicitly rejects their study. After describing how we as humans are able to know the stars because the *deus* descends from heaven and dwells in man, the astrologer exclaims: "dismiss the other arts in which such enviable skill has been granted [to man] and that are not gifts worthy of our reckoning" (*mitte alias artes, quarum est permissa facultas | invidiosa adeo, nec nostri munera census*, 2.109-10). All other areas of inquiry fall short of Manilius' *census*. The metaphor implies that other scientific fields are intellectually impoverished by comparison with the divine wealth of astrology, and that they do not belong to the world of counting and computation, to which astrology alone lays claim. Like the author of the *Epinomis*, Manilius demands that his fellow human beings engage in the study of the divine, and this means simply studying the stars. Occasionally, Manilius also questions the accuracy or practical value of other intellectual disciplines. In the proem to Book 4, for instance, he marvels

⁸¹ From a complementary perspective, one might argue that Manilius and his poem will achieve limitlessness or immortality because the subject matter of his poem (*deus, ratio*, the stars) is itself limitless or immortal. This is the point of Ovid's assessment of Aratus: "along with the sun and the moon, Aratus will always exist" (*cum sole et luna semper Aratus erit*, *Am.* 1.15.16). Manilius' infinite status is guaranteed from two related points of view.

at the shortcomings of medicine (4.69-76). Sometimes, he claims, a mild illness causes death, while a more serious one allows for recovery, and not infrequently the prescribed treatment fails or does more harm than good—“the arts give way, rational practice is overcome” (*succumbunt artes, rationis vincitur usus*, 4.74).⁸² In other cases, Manilius subordinates competing intellectual disciplines to astrology without undermining their knowledge or utility. Again, Book 4 informs us that Virgo produces natural philosophers (4.190-3), the Scales engender a facility with weights and measures (4.203-208), and Aquarius creates engineers who devise fountains, reservoirs, aqueducts, and even water-powered models of the heavens (4.259-72). Since astrology can account for and explain such practices, the practices themselves are in some sense inferior to astrology.⁸³ At the same time, those who work with weights and measures or with water perform manual tasks, and all of these fields try to provide some kind of practical benefit for mankind. This is a key point, and I suggest that Manilius dismisses other areas of inquiry for precisely this reason.

Consider the following passage. In the proem to Book 2, after explicitly rejecting the study of other *artes*, the poet describes his own audience:

sed caelo noscenda canam, mirantibus astris
 et gaudente sui mundo per carmina vatis,
 vel quibus illa sacros non invidere meatus
 notitiamque sui, minima est quae turba per orbem.
 illa frequens, quae divitias, quae diligit aurum,
 imperia et fasces mollemque per otia luxum. (2.141-6)

⁸² Such language engages with the didactic plague topos, which we will encounter in depth below in Chapter 4.2.

⁸³ Manilius also subordinates other intellectual disciplines and subsumes them within astrology in more oblique ways. At two points, the poet divides up the human body and assigns the various limbs to the zodiacal signs (2.453-65 and 4.701-709). The doctrine, known as melothesia, is connected with iatromathematics, and it implicitly claims priority for astrological knowledge in the treatment of the human body over scientific medicine. The lengthy geographical narrative that runs from 4.585 to 817 performs a similar maneuver.

I will sing things for the sky to know, with the stars wondering in amazement and the heavenly sphere delighting in the songs of its own poet, or for those to whom the stars have not begrudged their sacred movements and knowledge of themselves, which is the smallest crowd on earth. [But] vast is that [crowd] that loves riches and gold, power and the *fascēs* and soft luxury in one's spare time.

Manilius addresses his mathematical poem to the stars and to a small group of sympathetic intellectuals upon whom the stars have revealed the true nature of their workings. Although neither group needs Manilius' poem or the lessons that it contains, it is implied that both will delight in them and wonder at Manilius' song. Despite the ostensible goal of teaching the reader how to cast a reliable horoscope, it seems as though the infinite series of mathematical operations that the poem performs serves no purpose other than to reveal the mathematical order and regularity of the cosmos or *deus*. Moreover, this activity stands in stark contrast to the behavior of all those who live in everyday world and busy themselves with mundane matters, such as trading in the forum or running Rome's empire. Manilius' performance constitutes a divine task, one that appears entirely cerebral and ultimately divorced from practical utility of any kind.⁸⁴ Of course, it is well known that the *Astronomica* does not convey enough information to allow the reader to begin to practice astrology, and recent critics have asked what precisely the poem attempts to communicate or teach, if not astrology "pure and simple".⁸⁵ From this perspective,

⁸⁴ This and similar passages have generated much recent discussion, since the poet's elitist or perhaps determinist rhetoric blatantly contradicts Manilius' repeated claims to be able to teach the reader (i.e., *any* reader, even one who does not belong to the *minima turba*). I see no reason, however, why such rhetoric should not invite the reader to group himself with this privileged minority and to join them in marveling at the divine *ratio*. See Neuburg 1993: 276-82, Mann 2011, and Volk 2011: 110. Volk 2009: 207-8 treats the Callimachean resonances of the present passage as well.

⁸⁵ As Housman 1903-30: 1.lxxii puts it, "I defy anyone to cast a nativity from the information furnished in the poem as it stands"; cf. Volk 2009: 48-57 and 116-26. Neuburg 1993: 282 argues that Manilius "wants to promote astrology as a candidate for a universal religion". MacGregor 2004: 144 n.4 offers a radical but attractive formulation: "What [the five books of the poem]

Manilius, perhaps, rejects the practical *artes* precisely for being practical and simultaneously renders his own science impractical or abstract. Through a seemingly infinite accumulation of mathematical *rationes*, the student is led to contemplate divine *ratio* itself, and this is what truly matters.

Although he does not discuss the other *artes* at length, at one point Manilius does establish a comprehensive hierarchy of a multiplicity of scientific disciplines. The *Astronomica*'s intellectual framework presupposes a division of natural science into three categories: *terrena*, *sublimia*, and *caelestia*.⁸⁶ For Manilius, this epistemological hierarchy constitutes a temporal record of man's intellectual development as the human mind gradually ascended from ground level to the stars. First man stayed close to the earth (1.79-95). He learned about farming, sailing, augury, extispicy, and even how to raise the dead and disturb the depths of Acheron. Then human reason moved up to the sky (*nec prius imposuit rebus finemque modumque | quam caelum ascendit ratio*, 96-7). There it studied clouds, thunder, lightning, snow, hail, earthquakes, volcanoes, and other familiar topics of meteorology (1.96-105). Finally reason approached the heavens (*vicinam ex alto mundi cognoscere molem | intendit*, 107-108) and came to understand the stars, assigning them shapes and names, noting their cycles and movements, but also recognizing that they in fact control fate (1.106-12).

I want to make two related points. On the one hand, within this framework intellectual history and literary history overlap, and each of these areas of inquiry shows close associations

demonstrate is the divine governance of the universe, since [Manilius] has already proven that the stars themselves are Reason, and God (1.456-531). The usual assumption that Manilius is astrology pure and simple is thus a falsifiable hypothesis, and it is false". Once again, I cannot agree with Green 2011, who reads Manilius' failure to provide enough astrological information as a deliberate strategy to keep the reader confused and ignorant.

⁸⁶ The terminology is Seneca's (*NQ* 2.1). For the division, which derives ultimately from Aristotle and was common, see Hine 1981: 124-7.

with particular poetic figures. For instance, Manilius declares that “lengthy time sharpened human hearts, and toil endowed the wretched with creativity” (*acuit mortalia corda | et labor ingenium miseris dedit*, 1.79-80), eventually leading to the development of language and farming. In the *Georgics*, it is precisely Jupiter who sets agriculture in motion, “sharpening human hearts with anxieties” (*curis acuens mortalia corda*, *Georg.* 1.123), and in this world *labor* plays a significant role. So too Manilius finds that meteorological inquiry “freed men’s minds from feeling wonder at things and stole the thunderbolt from Jupiter and his power to thunder” (*solvit... animis miracula rerum | eripuitque Iovi fulmen viresque tonandi*, 1.103-104). Such language looks to the *DRN*, where Lucretius wages war on all that is wondrous or astounding and attempts to free the mind of man from fear. In particular, *DRN* 6 explains a variety of meteorological phenomena and argues against the very idea that “Jupiter pours forth lightening and sound onto the lands” (*Iuppiter in terras fulmen sonitusque profundit*, 6.401). From this perspective, Manilius’ account of *caelestia* looks to Aratus. Manilius states that human reason “allotted the proper forms and names to the signs and marked what cycles they followed under a sure law” (*attribuitque suas formas, sua nomina signis, | quasque vices agerent certa sub sorte notavit*, 109-10). In the *Phaenomena*, “one of the men no longer alive devised and contrived to call all [the constellations] by name, shaping them compactly” (τά τις ἀνδρῶν οὐκέτ’ ἐόντων | ἐφράσατ’ ἠδ’ ἐνόησεν ἅπαντ’ ὀνομαστὶ καλέσσαι | ἤλιθα μορφώσας, 373-5). Although the chronological order in which these three areas of science entered Greco-Roman literature (Aratus – Lucretius – Virgil) runs counter to Manilius’ sense of the historical order in which the sciences actually developed (farming – meteorology – astronomy and astrology), one thing is clear: Manilius himself stands at the end of this teleological narrative. Literary and scientific history culminates in the pages of the *Astronomica*.

On the other hand, this hierarchy effects a remarkable reversal of widespread intellectual values. Although ancient writers view astronomy and astrology as two sides of the same coin, they regularly observe that the results of astronomy are more reliable or accurate than those of astrology. Ptolemy, for instance, eagerly justifies the pursuit of astrology and emphasizes the powerful results to be obtained from a combination of astronomy with astrology. Nevertheless, he will systematically explain astrology for a very particular reason: “so that no one may compare the observations [of astrology] with the never changing certainty of [astronomy], keeping in mind the weakness in many areas [of astrology] and the difficulty of making out the quality of its material” (μήτε τὴν κατάληψιν αὐτοῦ παραβάλλοι τῇ τοῦ πρώτου καὶ ἀεὶ ὡσαύτως ἔχοντος βεβαιότητι, τὸ ἐν πολλοῖς ἀσθενὲς καὶ δυσεῖκαστον τῆς ὑλικῆς ποιότητος προσποιούμενος, *Apotel.* 1.1). Astronomy proper possesses a mathematical rigor that renders it absolute and unassailable, while astrology appears weak and faulty by comparison. Similarly, Aratus implicitly contrasts the reliability of the purely astronomical section of the *Phaenomena* with the much more conjectural nature of the so-called *Diosemeiai*. At the beginning of the *Diosemeiai*, Aratus warns his reader that we cannot always predict the weather accurately: “for we men do not yet know all things from Zeus, but many are still hidden, of which, if he wishes, Zeus will give [us signs] straightaway” (πάντα γὰρ οὐπω | ἐκ Διὸς ἄνθρωποι γινώσκομεν, ἀλλ’ ἔτι πολλὰ | κέκρυπται, τῶν αἴ κε θέλη καὶ ἐς αὐτίκα δώσει | Ζεὺς, *Phaen.* 768-71). The phrase and positioning of ἐκ Διὸς pointedly reminds the reader of the opening of the poem and underscores the transition from a state of sure knowledge to one of doubt and uncertainty. In the scientific hierarchy of the *Astronomica*, however, the situation is rather different. Like Ptolemy and Aratus, Manilius realizes that one needs astronomical knowledge before one can make predictions about the future. Thus, human *ratio*’s first activity when it reaches the heavens is

astronomical: “[it] allotted the proper forms and names to the signs and marked what cycles they followed under a sure law” (*attribuitque suas formas, sua nomina signis, | quasque vices agerent certa sub sorte notavit*, 109-10). Here, *ratio* begins to look more and more like calculation. Then comes an astrological enterprise: “[it noted that] all things were moved according to the divine will and arrangement of the cosmos, as the constellations altered fate with their varied order” (*omniaque ad numen mundi faciemque moveri, | sideribus vario mutantibus ordine fata*, 1.11-2). Manilius clearly privileges astrology, both temporally and spatially, over astronomy. The mathematical operations of his poem appropriate astronomical learning and effectively astronomize astrology itself. Through the *numeri*, *modi*, and *rationes* of astrological poetry, one studies the *deus* that pervades and orders the cosmos as a whole. No other science seems to matter at all.

Manilius’ assessment of the relative values of the sciences is heavily implicated in early Imperial intellectual debates, and not everyone will have agreed with him. One particularly striking criticism comes from the author of the anonymous *Aetna*. In that poem’s lengthy methodological digression, which we will consider in greater detail in the following chapter, the author openly questions the propriety of investigating the stars. After explaining the importance of studying the earth, the poet declares:

haec [sc. terra] nobis magis adfinis caelestibus astris.
 nam quae mortali spes est, quae amentia maior,
 in Iovis errantem regno perquirere divos,
 tantum opus ante pedes transire ac perdere segnem? (253-6)

[The earth] is more closely related to us than the heavenly stars. For what hope does a mortal have, and what madness is greater [than this], to search for gods while wandering in the kingdom of Jupiter, and to pass over so great a work at one’s feet and to lose it out of indolence?

By insisting that the earth, not the stars, bears a fundamental relationship to human beings, the *Aetna* poet rejects a basic principle of Stoicizing philosophy in general and of Manilian astrology in particular. But more significantly, line 255 (*in Iovis errantem regno perquirere divos*) plays with a common image regularly deployed by ancient investigators of nature. In the proem to the first book of the *Astronomica*, for instance, Manilius makes the following claim: “it is pleasing to go through the air itself and to walk and live in the immeasurable sky and to come to know the constellations and the backwards paths of the planets” (*iuvat ire per ipsum | aera et immenso spatiantem vivere caelo | signaque et adversos stellarum noscere cursus*, 1.13-5). Poets like Parmenides and Lucretius famously present themselves, or other investigators of nature, as heavenly travelers who explore the secrets of the universe—here Manilius imagines himself to be walking in a leisurely way through the cosmos that he plans to investigate.⁸⁷ The *Aetna* poet, however, subtly transforms Manilius’ *spatiantem* into an aimless and hence misguided or factually inaccurate *errantem*. The problem is one of priorities: we can only undertake a study of the stars, which exist at a great ontological and therefore epistemological distance, after achieving a thorough understanding of the ground below our feet. We will now turn to the *Aetna* poet and consider what exactly that ground looks like and what it means for our understanding of the natural world.⁸⁸

⁸⁷ For the topos and Manilius’ use of it, see again Landolfi 1999 and Volk 2002: 225-34.

⁸⁸ For a more detailed look at the *Aetna* poet’s critique of Manilius, see Lühr 1971.

Chapter 3: Science and Poetry in the *Aetna*

This chapter will explore the relationship between literary tradition and scientific inquiry in the anonymous *Aetna*. I will argue that, even though the poet champions scientific analysis of natural phenomena and sets forth an integrated theory on the nature of Aetna's volcanic activity, he continually encourages the reader to conceive of the mountain as a literary artifact that exists outside the world of scientific analysis. From the poet's perspective, science cannot suppress the literary history of the natural world, and literature cannot offer causal accounts of nature that satisfy contemporary demands for rationalism. Despite an ostensible opposition, these are complementary ways of thinking about and giving meaning to the natural world.¹

Before we begin, it is necessary to consider briefly the authorship, date, structure, and basic argument of the work. The poem itself belongs to the *Appendix Vergiliana*. In antiquity, the pieces that make up the *Appendix* were commonly ascribed to Virgil, and modern editors regularly print them together as a single corpus. Few scholars today, however, would attribute any of these works, let alone all of them, to Virgil, and this is particularly true of the *Aetna*.² Although numerous authors have been posited, no conclusive or even compelling evidence can

¹ Although critics occasionally acknowledge some sort of tension in the work, they regularly try to explain it away. Effe 1977: 211, for instance, promotes a Stoic religious world-view as “die Antwort auf die... Frage nach dem Zusammenhang von Ursachenerklärung und Mythenkritik”. Taub 2008: 54-5 and 2009 argues that, while the poet presents science and myth together, the poem itself uses science to limit and circumscribe the role of myth. I will argue, however, that science and poetic tradition mutually limit one another; this is a two way process.

² For the textual history of the *Appendix Vergiliana*, see Reeve 1983 and Iodice 2002: ix-xxxiii. At 260-9, the *Aetna* poet firmly rejects agriculture and, in so doing, engages in a polemical attack on the *Georgics*; modern critics find it extremely hard to believe, and I agree, that a young Virgil could have adopted such a stance. As Volk 2005a: 71 puts it, “Dass der zukünftige Autor der *Georgica* sich in einem Jugendwerk negativ über die Landwirtschaft geäußert hätte, ist unwahrscheinlich, wenn auch nicht unmöglich”. Di Giovine 1981 offers an in depth analysis of the poet's polemical engagement with the *Georgics*.

be adduced, and we must be content to leave the question unanswered.³ Determining the poem's date of composition has also vexed critics. Numerous linguistic parallels suggest that the poet has read a number of Seneca's works, particularly the *Natural Questions*, and the conspicuous lack of allusions to Vesuvius implies to many that the disastrous eruption that buried Pompeii in 79 had not yet taken place when the poem was written. A reasonable hypothesis, then, tentatively locates the work at some point after the composition of Seneca's treatise in the early 60s and before the infamous eruption of Vesuvius in 79.⁴ The text of the poem falls into three basic sections—an introduction (1-93), the main scientific exposition (94-567), and an epilogue (568-645). In addition, the main scientific exposition contains a lengthy methodological digression (219-81), as well as other shorter passages that do not actually advance the scientific argument.⁵ The scientific argument itself, however, is relatively straightforward. According to the poet, the earth contains a number of hollow cavities and passageways. Air regularly enters these subterranean spaces and occasionally becomes trapped and compressed within them. As this compressed air, called *spiritus*, struggles violently break to free, it can cause earthquakes or even ignite underground fires, which eventually erupt in spectacular explosions at the earth's surface.⁶ Although the fire itself draws nourishment from and liquefies a variety of combustible

³ See Goodyear 1984 and De Vivo 1989.

⁴ For the poet's familiarity with Seneca and for the general time frame outlined here, see again Goodyear 1984 and De Vivo 1989.

⁵ For alternate and more detailed divisions of the work, see Büchner 1955-8: 1140-6, Goodyear 1984: 345-6, De Vivo 1985, and Toohey 1996: 189-90.

⁶ The poet does not explicitly state how *spiritus* manages to ignite a fire. Volk 2005a: 76-7 + nn.21-5 suggests either that *spiritus* causes friction, which then generates a spark, or that *spiritus* spontaneously turns into fire. Numerous scientists discuss the first theory as a possible source for various kinds of fire, and certain texts describe the ways that one of the four elements (e.g., air) can change into another (e.g., fire). Cf. Iodice 2002 on 361-5.

fuels, such as sulphur and alum, the *lapis molaris*, or lava-stone, constitutes Aetna's primary fuel, which it alone possesses and which gives it a special nature. Most of the pieces of this theory constitute widely held ancient beliefs about both Aetna and other types of volcanic phenomena, and I will not be concerned with tracing their origins or permutations here.⁷

The following discussion will fall into three parts. I begin by examining the opposition between scientific analysis and poetic tradition, primarily in the poem's introduction. Then I consider the representations of the mountain, and also scientific analysis, in the main scientific exposition. I conclude by looking at the various ways in which the poet undermines or supplements the value of scientific inquiry by the use of literary tradition in both the main scientific exposition and the epilogue.⁸

1. The Rejection of the Literary Tradition

⁷ For the intellectual history behind the poet's theory, see Paisley and Oldroyd 1979: 11-14, Goodyear 1984: 346-56, De Vivo 1989, Bianchetti 1998, and Garani 2009: 120-1. Bianchetti 1998, Sigurdsson 1999: 34-70, and Hine 2002 discuss ancient theories about and attitudes towards volcanic phenomena in general, although the outline of early Greek thinking about volcanic activity at Sigurdsson 1999: 36 erroneously states that Anaxagoras, Democritus, and Archelaus posited subterranean air as the cause of volcanic eruptions. A connection between subterranean air, earthquakes, and fire does appear in Anaxagoras (DK 59 A 89), and Guthrie 1965: 311 considers it "very plausible" that he may have linked earthquakes and volcanic activity. However, the first extant text to connect subterranean air with volcanic activity explicitly is a brief mention of Hiera at Aristotle *Meteor.* 2.8. The connection later becomes commonplace; see, e.g., Lucr. 6.639-702, Ovid *Met.* 15.340-55, Justin 4.1, Servius ad *Aen.* 3.571, and Isidore 14.8.14, all about Mt. Aetna. For a comprehensive introduction to the modern science of volcanology, see Schmincke 2004. Chester, Duncan, Guest, and Kilburn 1985 offer an exhaustive modern scientific account of Aetna's volcanic activity, and Schmincke 2004: 18-9 provides a brief but usefully illustrated account as well.

⁸ It should be noted that the text of the poem is extremely corrupt and that the various editions can differ radically from one another. In general, I follow the text of Goodyear 1965 and discuss textual problems only when they affect my actual argument.

The poem's introduction (1-93) launches a lengthy attack on mythological poets who incorrectly explain Aetna's volcanic eruptions with fantastic and impossible narratives. In so doing, it ostensibly establishes a firm dichotomy between scientific inquiry into natural phenomena and groundless poetic speculation. It is my contention, however, that in the *Aetna* science and literary tradition mutually limit one another. I will argue that this tension permeates the poem itself, and that recognizing its presence allows us to see how the action of the poem anticipates the larger drama of the poem as a whole.

Before turning to the poem itself, it is essential to recognize that by the middle of the first century CE Mt. Aetna had ceased to be a living breathing natural phenomenon and had become instead essentially a literary phenomenon. Due to the slow but continual collision of the African and Eurasian continental plates, the Mediterranean world exhibits a wide variety of volcanic activity.⁹ In the first century CE, however, volcanic phenomena appear to have been relatively rare in the area,¹⁰ and few individuals were likely to have had first-hand experience of volcanic activity of any kind.¹¹ Mount Aetna does not constitute an exception to this trend. Although Aetna had been quite active in the middle of the first century BCE, erupting violently five times between the years 50 and 38, it does not appear to have displayed any further significant eruptive

⁹ Schmincke 2004: 13-20 provides a lucid account of the modern theory.

¹⁰ Stothers and Rampino 1983 provide the most complete collection of ancient reports of volcanic activity in the Mediterranean, and discuss and evaluate the available evidence more judiciously than other modern scientific authors. According to their analyses, Vulcano and Stromboli were intermittently active; fire burned on Mt. Chimaera and on the mountains of Hephaestium; Thera erupted in 46; flames shot out of the ground near Cologne in 58; and Vesuvius erupted in 79.

¹¹ Cf. Hine 2002: 58, who notes that "volcanoes were few and localized, and the activity sometimes only apparent at long intervals".

characteristics until 252 CE.¹² Neither the author nor the original readers of the *Aetna* will have witnessed the kinds of fantastic volcanic fireworks that the poem continually describes. But *Aetna* does have a rich mythological history, and descriptions of its catastrophic explosions figure prominently in Late Republican and Imperial literature. While writing to Lucilius, for example, Seneca is able to single out this scene as exemplifying the virtues of poetic imitation and emulation:

quid tibi do ne Aetnam describas in tuo carmine, ne hunc sollemnem omnibus poetis locum attingas? quem quominus Ovidius tractaret, nihil obstitit quod iam Vergilius impleverat: ne Severum quidem Cornelium uterque deterruit. omnibus praeterea feliciter hic locus se dedit, et qui praecesserant non praeripuisse mihi videntur quae dici poterant, sed aperuisse. (*Ep.* 79.5)

What can I give you to keep you from [merely] describing *Aetna* in your poem, to keep you from touching lightly on this passage that is traditional among all poets? The fact that Virgil had already treated it fully in no way prevented Ovid from handling it, nor did either of them deter even Cornelius Severus. Moreover, this passage has happily given itself to all, and those who went first do not seem to me to have snatched away what could be said, but rather to have opened the way.

For Seneca, *Aetna* is the poetic topos par excellence, and his analysis of the literary life of the mountain quickly turns into praise for the principles of *imitatio* and *aemulatio*. The same holds true at later dates. When Aulus Gellius wishes to offer a critique of imitation and emulation, he presents Favorinus discoursing on Virgil's method of composition and comparing that poet's supposedly flawed attempt to outdo Pindar in an account of an eruption of *Aetna* (*NA* 17.10).

¹² Stothers and Rampino 1983: 6365 find that *Aetna* was "active at times" in the first century CE, but cite mostly examples of the *Aetna* topos and do not find evidence of any major explosions (6367). Chester, Duncan, Guest, and Kilburn 1985: 96-7 record additional eruptions, but fail to take into account the highly dubious nature of many ancient reports (e.g., as parts of omen lists). Siebert, Simkin, and Kimberly 2010: 53 are slightly more cautious, and Romano and Sturiale 1982 go so far as to conclude that *Aetna* erupted only twice between 122 BCE and 252 CE. It is true, however, that *Aetna*'s craters are almost continually active in some fashion, and technical writers are aware of this (e.g., Strabo 6.7-8, Pomp. Mela 2.119, and Pliny 2.236). Still, the dramatic eruptions that constitute the *Aetna* topos appear to have been lacking. Seneca, then, can declare that *Aetna* appears to be less active than in the past (*Ep.* 79.2), and Petronius can refer to *Aetna*'s "unfamiliar fires" (*iamque Aetna voratur | ignibus insolitis*, *Sat.* 122.135-6).

Once again the mountain itself represents a fundamental topos of ancient poetry and provides the critic with an image of the vital forces that fuel literary creativity.¹³

The Aetna poet, too, is keenly aware of the mountain's status as a preeminent topos, what I will call "the Aetna topos", and this chapter will show that the poet's creative engagement with that topos is fundamentally concerned with the intellectual value of poetry itself.¹⁴ To begin with, early in the work the poet criticizes the familiar mythological story-lines through which the topos traditionally explains the mountain's eruptions. Some attribute the mountain's explosions to Vulcan's smithy, others blame the work of the Cyclopes, and still others suppose they are due to the fiery breath of Enceladus, a giant who lies imprisoned beneath the massive rock.¹⁵ The poet dismisses the stories about Vulcan and the Cyclopes for clear reasons: the gods do not take an interest in such mundane matters (*non est tam sordida divis | cura*, 32-3), there is no evidence of Cyclopes (*turpe et sine pignore carmen*, 40), and both accounts cannot be true at once (*discrepat a prima facies haec altera vatum*, 36). The first response evokes longstanding moral and/or philosophical claims, familiar to Epicureans and Stoics, but common currency since at least the

¹³ Cf. Juvenal 1.7-9, where the satirist mocks clichéd poetic descriptions of Vulcan's workshop, and Macrobius *Sat.* 5.17.7-14, where the compiler very nearly reproduces Gellius *NA* 17.10. Note that Greek writers sometimes emphasize Aetna's connection with poetry in similar way; see, e.g., Philostratus *VA* 5.16.1.

¹⁴ Although critics such as Goodyear 1984: 350 and Taub 2008: 52 and 2009: 129 regularly mention Aetna's status as a topos, few make this a central concern of their analyses. Leroux 2004, however, explicitly recognizes the generic connection between Aetna and epic, and considers the implications of this connection for Latin representations of the mountain. In addition, Taub 2008: 53 well notes that "in the *Aetna* poem, Etna is not only a *topos*, but is the subject of the work". It should also be pointed out that Romans considered Aetna to be the volcano *par excellence* (see Leroux 2004: 57 and Volk 2005a: 73); even when it was not being used as a literary topos, it still constituted something of a cliché.

¹⁵ See Leroux 2004 for the ways these and other myths connected with Aetna are treated in Latin epic.

sixth century BCE.¹⁶ The second highlights the scientist's demand for physical proof, and the third places a premium on argumentation and logical consistency. In addition to being morally unacceptable, the stories in question lack evidence and present conflicting explanations of natural phenomena.¹⁷ The accounts of Vulcan and the Cyclopes are relatively brief and straightforward (7 and 5 lines, respectively). The Enceladus myth, however, presents the reader with something entirely different, a full-blown Hellenistic epyllion on the subject of the Gigantomachy running to some 33 lines.¹⁸ Although the poet denounces the story as an "impious tale" (*impia... fabula*, 42) and protests loudly at its contents (*nefas*, 43), he does not directly refute its claims. Nevertheless, the narrative is clearly exposed to the same sorts of criticism leveled against the other mythological stories.

From our perspective, three points need to be made. First, it is essential to note that these attacks take aim not simply at mythology or mythological ways of thinking, but specifically at poets and at the literary Aetna topos.¹⁹ Thus the initial critique is introduced as a warning: "first of all, do not let the deceit of the poets fool anyone" (*principio ne quem capiat fallacia vatum*,

¹⁶ For Epicureans, see Lucr. 1.44-6 and Cic. *ND* 1.51. For Stoics, see Cic. *Div.* 1.118 and Sen. *NQ* 2.46. For earlier material, see Xenophanes DK 21 B 11.

¹⁷ At no point in time are the three myths mutually exclusive. Thus Ps.-Aeschylus *PV* 363-72 places Typhos below Aetna and Hephaestus at its peak, characterizing the latter as a blacksmith and attributing to the former a future eruption; Callimachus *Hymn* 4.141-6 blames the giant Briares for Aetna's shaking and then describes Hephaestus' smithy; Virgil presents the Cyclopes hard at work at *Georg.* 4.170-5 and then narrates the Enceladus story at *Aen.* 3.570-82 (note *Cyclopum adlabimur oris* at 3.569). Philostratus *VA* 5.16 intellectuals other than poets staged debates over the veracity of such narratives.

¹⁸ *olim* (43) sets the episode in the distant past (= "once upon a time") and figures regularly in Greek and Latin epyllia, being equivalent to *quondam* and ποτέ. Cf. Callimachus *Hec.* 230Pf., Theocritus 24.1, Moschus *Eur.* 1, Catullus 64.1, 76, 212, and Manilius *Astr.* 5.54. See Ross 1975: 78-9, who connects the usage with other common Hellenistic and neoteric tags.

¹⁹ Cf. Philostr. *VA* 5.16, mentioned above, where Philostratus has Apollonius of Tyana complain about the false mythological stories that poets routinely sing about Aetna.

29). The digression on Enceladus is characterized in a similar way: “this is the widespread license of lying rumor. Poets have cleverness, and hence noble poetry commits a great many acts of daring” (*haec est mendosae vulgata licentia famae. | vatibus ingenium est, hinc audet nobile carmen | plurima*, 74-6).²⁰ In both cases, the author of the *Aetna* sets himself in opposition specifically to *vates*. The attack on mythological narratives in general and on *vates* in particular recalls Lucretius’ assault on *religio* in the first book of the *DRN*. The author of the *Aetna*, however, does not concern himself with religion or the fears that it inspires, but rather with the false stories about the mountain that figure prominently in Latin literature. By the mid first century CE, *vates* had long been a clichéd synonym for *poeta*, and the author of the *Aetna* refuses to align himself with the hack poets who rehash scientifically inaccurate stories about the mountain.²¹ Virgil offers a particularly striking example. Not only does Virgil show Vulcan’s workshop teeming with life (*Aen.* 8.416-53) and describe the activity of the Cyclopes (*Georg.* 4.170-5), but he also narrates the story of Enceladus after recounting a vivid volcanic eruption (*Aen.* 3.570-82).²² No author offers an approach to Aetna that contradicts current scientific opinion so thoroughly.

²⁰ *audet* in 75 is Barth’s emendation for *audit*. Goodyear 1965: 118 prints *audit* and translates thus: “poets have talent... hence poetry gets its fame”. This usage, however, is not common, and the larger context concerns the various ways in which poets violate the natural world by spreading false information about it. They commit crimes of great *audacia*.

²¹ This impression is reinforced by the fact that from 9 to 23 the poet lists a variety of poetic clichés that he refuses to celebrate in song (e.g., the golden age, Medea, the Trojan War). The list is similar to the opening lines of Juvenal 1.

²² Although Virgil technically situates Vulcan’s smithy on the island Lipare (*Aen.* 8.417), he locates beneath it the “Aetnaean caves” of the Cyclopes (*antra Aetnaea*, *Aen.* 8.419), his Vulcan addresses the Cyclopes as “Aetnaean” (*Aetnaei Cyclopes*, *Aen.* 8.440) and the concluding lines of the passage echo the account of the Cyclopes under Aetna from *Georg.* 4.

Second, our author attacks the Aetna topos as just one example of a more general poetic tendency to misrepresent the natural world. Poets, for instance, sing songs about the *Ditis pallentia regna* (78) and describe the likes of Tityos, Tantalus, Minos, Aeacus, and Ixion (80-3). At the same time, they direct their gaze to the heavens and compose works about wars between the gods, divine marriages, and Jupiter's liaisons with Europa, Leda, and Danaa (85-90). Although these kinds of attacks are again reminiscent of Lucretius,²³ the emphasis falls squarely on poetic misrepresentations of the natural world, rather than on mythological narratives in general or the fear inspired by false narratives about the divine. The author scornfully admits that "this kind of freedom is owed to poems" (*debita carminibus libertas ista*, 91), but such poems do not accurately depict the world around us and repeatedly fail to take into account the methodological principles of scientific inquiry. The poets in question, for example, claim to have actually seen (*viderunt*, 77) what goes on underneath the earth. It will soon become clear that autopsy plays a crucial role in the poet's own methodology—these *vates* have no right to suggest that their stories are based on firsthand observation. They also have no right to lay claim to knowledge (*norunt*, 87) about events that violate basic scientific principles. This is the intellectual thread that connects the stories of Europa, Leda, and Danaa, all of which show human women sleeping with and producing offspring from a Jupiter who assumes various fantastic identities.²⁴

Third, it is important to note that the poet's assault on literary misrepresentations of the natural world can also be read as part of a broader critique that informs the work as a whole.

²³ Compare, e.g., Lucr. 3.978-1023, where the Tantalus and Tityos stories are criticized.

²⁴ Effe 1977: 209-210 perhaps goes too far in arguing that "Die Kritik geschieht zum Zwecke der Läuterung des Gottesverständnisses im Sinne einer gereinigten, wahren Religion." However, Effe rightly notes that the *Aetna* poet does not reject myth in and of itself, and myth will play a crucial role in the poem.

This critique finds fault with all those who fail to adopt an appropriate attitude towards the natural world. According to our author, human beings have a responsibility to investigate nature—as he puts it in the methodological digression, “to know the proof of things and to examine doubtful causes” (*nosse fidem rerum dubiasque exquirere causas*, 226; cf. 270-81).²⁵ The mythological narratives of the poets obscure the *fides rerum* and keep the true *causae* of natural phenomena obscure. This is a point upon which our author elaborates in two key sections of the poem, the methodological digression and the epilogue. We will consider them in reverse order. On the one hand, the epilogue contains a lengthy complaint about tourists who visit Thebes, Sparta, Athens, and Troy, and who admire Greek paintings and sculptures (568-98). Most of these cities and works of art are intimately connected with myth and poetry.²⁶ According to our author, when we engage in such activities “we greedily unearth the lies of ancient stories” (*avidī veteris mendacia famae | eruimus*, 571-2), and he finds it unacceptable that the reader might think that such sites and objects are worth visiting but refuse to investigate the natural world itself (*haec visenda putas terrae dubiusque marisque?* 599). Although they do not spread false information about the natural world, these tourists do not pay nature the attention it rightly deserves—they are obsessed with the history of manmade artifacts, both literary and material.²⁷

²⁵ Cf. Taub 2008 and 2009, who argues that one of the poet’s central concerns is “to encourage others to participate and engage in the study of natural phenomena” (2009: 125). She considers this to be “the ethical pitch” of the poem (2008: 52). For more on the poem’s ethics, see the discussion of the Catana narrative below in section 3.

²⁶ See the notes in Duff and Duff 1934: 412-15, and note *carminibus* at 582 and *carmen* at 585. The one exception seems to be Sparta, which the poet appears to associate with the battle of Thermopylae. See Goodyear 1965: 202-3 on line 580.

²⁷ Volk 2005a: 88-90 argues that a polemical contrast runs through this entire passage, a contrast between Greece and Rome or, rather, Greek poetry and Roman poetry: “An die Stelle der von Unwahrheit geprägten, dekadenten griechischen Literatur tritt die der Wahrheit verpflichtete, erhabene lateinische Dichtung (p. 89). From this perspective, the poet’s critique of farming

On the other hand, the methodological digression develops a lengthy diatribe against two groups of people who do interact with nature, but who do so in inappropriate ways, through mining and agriculture (257-69). Both activities attempt to dominate the earth while changing its appearance or composition (e.g., *torquentur flamma terrae ferroque domantur* at 278), and both cause mental or physical anguish in the pursuit of financial gain (e.g., *torquemur miseri... premimurque* at 257, and *leves cruciant animos et corpora causae* at 266). Although the complaint against greedy individuals who violate natural boundaries in their quest for precious metals constitutes a common theme in first century literature,²⁸ the rejection of agriculture for similar reasons comes as quite a surprise. The poet, it seems, rejects all activities that put the natural world to practical use and so exploit or abuse its original state—even farming, the most traditional and Italian of occupations. Like poets and tourists, miners and farmers do not know the *fides rerum* and remain unconcerned with natural philosophical *causae*. All four groups approach the natural world from fundamentally flawed perspectives.²⁹

The reader, then, is meant to learn a lesson about the proper relationship between *natura* and human activity. This lesson will be conveyed primarily through the poet's exposition of Mt. Aetna and his substitution of scientific analysis for the groundless lies of the literary Aetna topos. This process of substitution is at work already in the opening lines of the proem, where the poet first invokes the topos by describing an eruption:

parallels his critique of mythological poetry; both do violence to, or teach others how to do violence to, the natural world.

²⁸ E.g., Manil. 5.276-7, Sen. *NQ* 5.15, *Cl.* 1.3.5, Pliny *Nat.* 33.2, and Tac. *Ger.* 5.2. For further parallels, see Vottero 1989: 552 on Sen. *NQ.* 5.15.

²⁹ Critics such as Effe 1977: 219 n.34, Di Giovine 1981, and Volk 2005a: 86-7 and 2005b: 170-1 have also observed that through the attack on agriculture the poet distances himself from the *Georgics*. He rejects both those who work the earth and those who sing about doing so.

Aetna mihi ruptique cavis fornacibus ignes
 et quae tam fortes volvunt incendia causae,
 quid fremat imperium, quid raucos torqueat aestus,
 carmen erit. (1-4)

[The subject of] my poem will be Aetna, and the fires that burst from its hollow furnaces, and what are the causes that are so strong and that roll forth conflagrations, why it grumbles at being ruled, why it shoots forth its harsh-voiced blazes.

Two points need to be made. First, the author signals his status as a didactic poet who will explain the world from a scientific perspective. As we saw in Chapter 1.2, Latin didactic regularly announces its subject matter through a series of indirect questions. Accordingly, the present series of indirect questions vividly connects the poem's opening lines with the didactic tradition.³⁰ Second, the poet's vocabulary clearly connects his work with the terminology of the Aetna topos. At the end of the first *Georgic*, for instance, Virgil describes Aetna in the following terms: "how often did we see Aetna boil over into the fields of the Cyclopes, undulating from its ruptured furnaces, and roll forth balls of flames and melted rocks" (*quotiens Cyclopum effervere in agros | vidimus undantem ruptis fornacibus Aetnam, | flammaramque globos liquefactaque volvere saxa*, 1.471-3). Both poets use verbs like *rumpo* and *volvo* and nouns like *fornaces* to describe Aetna's tempestuous explosions, and many of the other terms and images in both passages occur regularly when the topos is invoked.³¹ These lines, then, propose a scientific

³⁰ De Vivo 1985: 260-3, Volk: 2005a, 2005b, and Taub 2008: 51-2 and 2009: 126-8 consider additional ways in which the poet aligns himself with the didactic tradition in these lines. The use of *causae* also suggests a strong didactic and/or natural philosophical drive; cf. De Vivo 1985: 267-8.

³¹ Sudhaus 1898: 2, Vessereau 1923: 45, Solmsen 1957, and De Vivo 1985: 260-1 provide further parallels and discussion. Much of the terminology represents traditional ways of writing about Aetna. Virgil's *volvere* and the *Aetna* poet's *volvant*, for example, have a clear predecessor in Pindar *Pyth.* 1.24 κυλινδομένα φλόξ. Numerous critics have assumed that Virgil here (and/or elsewhere) describes an actual eruption of Aetna in 44 BCE. Forsyth 1988 argues forcibly for an eruption in that year, but that does not mean that Virgil is not also engaging closely with Pindar.

attack on literary tradition while simultaneously deploying the language of that tradition. The key point is that the poet de-mythologizes this language—our poem may contain *fornaces*, but no Cyclopes will toil away at them.³² In this way, the poet begins to engage the Aetna topos precisely as Seneca and Gellius would have wished, both imitating and attempting to one-up or outdo the texts of his numerous predecessors.

But the opposition between scientific analysis and poetic tradition is not as firm as this preliminary reading suggests. In the following lines, the poet invokes Apollo as the *auctor* (4) of his poem and urges the god, along with the Muses, to leave Pieria and journey with him to Aetna: “and with you, may the sisters hasten from the Pierian font, favoring my new wishes: it is safer to travel through unfamiliar territory with Phoebus acting as guide” (*tecumque faventes | in nova Pierio properent a fonte sorores | vota: per insolitum Phoebus duce tutius itur*, 6-8). The appeal to Callimachean aesthetics and stylistic ideology, symbolized by the poet’s close connection with Apollo and his preference for the “unfamiliar” path, is traditional.³³ Aetna the mountain and *Aetna* the poem are fundamentally literary and fully embedded in the poetic culture and literary history of the *vates* whom our author criticizes. Of course, there is a subtle joke in play here—nothing could be more hackneyed or clichéd than a description of Mt. Aetna and its destructive fires. The work’s novelty, then, will consist in its specifically scientific and anti-mythological approach to a profoundly familiar literary set-piece.³⁴ It is this change in

³² The poet repeatedly performs this kind of maneuver; for a particularly striking example, see Garani 2009: 108-11. With respect to the demythologized *fornaces* in particular, a variety of ancient sources think of volcanoes as behaving like giant furnaces in which fire is ignited, or its intensity increased, by blasts of air from a pair of bellows; see Paisley and Oldroyd 1979: 4 and Hine 2002: 69 + n.37.

³³ See Kambylis 1965 and Asper 1997.

intellectual outlook that explains why the poet must abandon Pieria, home to the Muses of Hesiod (*WD* 1) and Lucretius (*DRN* 1.926 = 4.1), and actually travel to Aetna—a new kind of poetry calls for a new spring of inspiration. This is the poet's project, and it is inherently dangerous. From the perspective of literary tradition, such a rationalizing attempt to replace the mythology of Aetna with scientific fact constitutes a serious threat. So, too, from the perspective of rational inquiry, Aetna constitutes a formidable challenge as one of the most intimidating literary topoi of antiquity. Both perspectives help explain why the poet emphasizes the potential danger of his enterprise (*tutius itur*). Only with Apollo as *auctor*, a term that simultaneously suggests poetic inspiration and scientific source, can the rational investigator of nature reach his ultimate destination. Science and poetic tradition, it seems, must work together. Any attempt to separate them runs the risk of faltering.

2. Scientific Inquiry and the Marvelous Mountain

In the main scientific exposition of the poem (94-567), the author sets out his own theoretical account of the workings of the mountain. Instead of focusing on the details of the theory, however, I want to draw attention to the ways in which the poet subtly distinguishes himself from the literary Aetna tradition and from earlier traditions of scientific analysis. By looking at how the author represents the very process of scientific inquiry and carefully negotiates a

³⁴ This can be closely connected with a generic point. Although it appears in the *DRN* and the *Georgics*, Aetna is fundamentally associated with epic. As Leroux 2004 points out and discusses at length, all extant Latin epics, from Virgil to the Flavian epicists, depict Aetna's eruptions, and these depictions are in dialogue with one another. It is tempting to argue that when the *Aetna* poet rejects the *vates*, he specifically rejects epic *vates*, and when he chooses to write a didactic poem, he specifically sets himself in opposition to epic poetry. Herein, too, lies the novelty and the danger.

traditional conception of the mountain, we will gain a clearer understanding of the positive role he assigns the rational investigation of nature.

What sets the poet apart from his literary predecessors are his methodology and theoretical commitments. Since he has abandoned the mass of traditional material that inaccurately accounts for Aetna's explosive nature, the poet must begin from scratch. As his main intellectual tools, he relies on careful observation and logical inference based on analogy, two traditional modes of scientific analysis.³⁵ The poet's first task is to establish the existence of subterranean passages through which air can travel and ultimately set in motion a volcanic eruption. He begins, therefore, by drawing a comparison between the earth and the bodies of living creatures:

utque animanti
per tota errantes percurrunt corpora venae
ad vitam sanguis omnis qua com meat, † idem
terra foraminibus conceptas digerit auras. (98-101)

And just as wandering veins run throughout the whole body in a living creature by which all the blood flows to produce life, [so too] the earth directs airs that have been captured in its cavities.

Ancient medical theory held that veins carried blood, or a mixture of blood and air, throughout the body.³⁶ By relying on well-established medical knowledge about the anatomy of living organisms, then, the poet immediately renders plausible, or at least comprehensible, his initial theory about the composition of the earth. At the same time, the earth itself begins to acquire

³⁵ De Lacy 1943 argues that the principles at play here are fundamentally Epicurean. The poet's emphasis on autopsy and analogy, however, resonate with a wide variety of intellectual approaches and should not be misconstrued as aligning him with a particular philosophical school; Goodyear 1984: 355 and Garani 2009: 104 n.5 discuss the matter quite reasonably. For the poet's use of analogy, see Effe 1977: 207, Taub 2008: 49-51 and 2009: 132-4, and especially Garani 2009. For analogy in general as an intellectual tool in antiquity, see Lloyd 1966.

³⁶ For the theory, see Asso 2010: 179 on Lucan 4.326-7; he cites Cic. *ND* 2.138, Sen. *NQ* 3.15.1, and Gell. *NA* 18.10.9. Cf. Garani 2009: 105-6.

some of the characteristics of an animate body. This comparison, however, is further bolstered by sensory evidence, particularly autopsy. For instance, the poet notes that certain rivers disappear underground and then unexpectedly emerge at a great distance. He reasons that if the earth did not contain hollow channels or passageways, these rivers would have no way of moving from one locale to the next, and he then reaches the following conclusion: “It is hardly surprising if there are also empty passages that lie hidden with winds locked up inside them. The earth will give you tokens in succession by means of sure facts and [these tokens] will cling to your eyes” (*haud mirum clausis etiam si libera ventis | spiramenta latent. certis tibi pignora rebus | atque oculis haesura tuis dabit ordine tellus*, 134-6).³⁷ Observation and inference, represented by *oculi* and *pignora*, neutralize the wondrous or astounding aspect of certain natural phenomena, a process epitomized by the phrase *haud mirum*. Moreover, the earth itself seems willing or even eager to assist the attentive investigator, providing him with easily accessible clues as to its own nature. In some sense, the earth wants to be understood correctly, and the poet is here to facilitate the job.

Scientific inquiry, then, appears to be a relatively straightforward and unproblematic search for facts that removes the natural world from the sphere of poetic tradition one step at a time. Unfortunately, it is not always possible to decide what the facts are, and in such cases the poet puts forward a number of possibilities. For instance, observation and inference compel us to conclude that the earth contains hollow passageways, but it may not be possible to determine the origin of these passageways. From 102 to 117, the poet lists the various hypotheses: either the earth was formed this way originally, or the passage of time is responsible, or air has caused such perforations, or water has done so, or fire is their origin, or all of these factors have played a

³⁷ Garani 2009: 107-8 notes that the phrase *libera spiramenta* continues the analogy with the human body.

role. The poet then declares, “the cause does not need to be taught here, provided the effect of the cause stands firm” (*non est hic causa docenda, | dum stet opus causae*, 116-7).³⁸ Multiple explanation constitutes another familiar tool of natural philosophical analysis, especially in Epicureanism, and regularly takes just this form.³⁹ The poet offers no theoretical justification for his refusal to decide on a *causa* and continues with his exposition, giving the impression that he has exhausted the possibilities and that scientific analysis remains a fundamentally straightforward undertaking.

Other passages in the text, however, suggest that the business of scientific investigation is a good deal more complex. In an extended discussion of his own methodological principles, the poet characterizes scientific investigation as an active process that constructs order and actually shapes the natural world. An extraordinary sentence that runs from lines 224 to 250 presents an exhaustive catalogue of astronomical and meteorological phenomena worthy of systematic study.

The list concludes as follows:

et quaecumque iacent tanto miracula mundo
 non congesta pati nec acervo condita rerum,
 sed manifesta notis certa disponere sede
 singula, divina est animi ac iucunda voluptas. (247-50)

And whatever wonders lie about in so great a world, not to suffer them to be heaped up nor buried in a pile of things, but to arrange individual items with marks in a sure seat so that they will be manifest, this is the divine and delightful pleasure of the mind.

³⁸ *docenda* is Gorallus’ emendation for *dolendi*. Although *dolendi* gives good sense (“there is no cause here for grief”), it involves taking *causa* in 116 and 117 in two different senses (“motive, reason” vs. “natural philosophical cause, rational principle”). The awkwardness is not impossible, and *dolendi* may be right; it does not affect the argument here though.

³⁹ For more on this passage in general and poet’s use of multiple explanation in particular, see Taub 2008: 49-51 and 2009: 133, and Garani 2009: 105-7. Hardie 2009: 231-63 discusses Lucretius’ use of this technique and its reception in later Latin poetry, although he does not mention the *Aetna*.

In contrast to those who would simply allow the incomprehensible wonders of the natural world to lie idle in undifferentiated heaps, the student of the heavens places each particular item in its proper place and renders it intelligible. Scientific investigation constitutes an active process that catalogues and classifies the otherwise undigested phenomena of nature and thereby produces its own intellectual universe. In this way, scientific investigation also acts as a form of cosmogony. The key lies in *disponere*, a term that figures prominently in Ovid's cosmogony (*Met.* 1.32) and occasionally describes the generative activity of the Stoic *logos* or god.⁴⁰ From this perspective, the scientist becomes an almost superhuman figure who alone creates and hence understands and controls the natural world. And yet, our poet is not interested in studying the stars—he sets astronomical study aside and insists that a more urgent area of inquiry lies ready to hand: “but this concern comes first for man, to know the earth and to mark the wondrous things that nature has brought forth in it” (*sed prior haec homini cura est, cognoscere terram | quaeque in ea miranda tulit natura notare*, 251-2).⁴¹ Although he contrasts astronomical study with inquiry into the earth, the poet's attitude towards the fundamental nature of scientific investigation applies to both endeavors. Just as the astronomer contemplates *miracula* and distinguishes them with *notae*, so too the student of the earth must look into *miranda* and proceed to *notare*. The passivity of everyday life, characterized as *pati* in the first passage, constitutes the intellectual opposite of scientific investigation, characterized as *cognoscere* in the second passage. Science's

⁴⁰ See, e.g., *SVF* 1.160 and Seneca *Ep.* 16.5. For further examples, see Bömer 1969: 29. Note that *congesta* may also look to *Met.* 1.8. Later, the poet also insists on the importance of *disponere*, warning that it is no possible to “arrange” the natural world correctly if one clings to false ideas (*sed frustra certis disponere singula causis | temptamus, si firma manet tibi fabula mendax*, 510-11).

⁴¹ For this kind of *recusatio*, see Volk 2005a: 86-87 and 2005b: 161-63. As noted at the end of Chapter 2.3, this *recusatio* takes aim at Manilius in particular. The *Aetna* poet rejects both studying and writing poetry about the stars; before we can undertake such a project, we need to study and compose verse about the ground below our feet.

task consists in assigning individual phenomena to individual causes and transforming the miraculous appearance of the natural world into a comprehensible whole. It is precisely this taxonomic activity that attempts to operate outside the literary tradition of the Aetna topos. It counts as true intellectual pleasure (*divina est animi ac iucunda voluptas*), and does not serve any practical end. This is a key point. The *Aetna* poet does not present scientific analysis as a utilitarian endeavor, and just as he finds fault with miners and farmers who exploit the earth, so too he promotes a type of intellectual activity that does not seek to profit from its object of study.⁴²

There remains another essential point to make about these passages. They suggest that scientific inquiry always takes as its object something wondrous or amazing (*miracula* or *miranda*) and then explains the physical causes lying behind it so that the phenomenon in question becomes *haud mirum*. Similar ideas about the objects of natural philosophical inquiry appear already in Plato and Aristotle (*Theaet.* 155d and *Metaph.* 982b 11-24, respectively), and subsequent investigators of nature, such as Lucretius, regularly protest against the initial amazement with which the natural world overwhelms ordinary people. The *Aetna* poet, however, continually refers to the mountain and its eruptions as wondrous or astounding spectacles—“a great many wonders can be seen on that mountain” (*plurima... patent illi*

⁴² Cf. Taub 2008: 48 and 2009: 131, who cautiously characterizes the poet’s aims as approaching a modern idea of “pure science” or “science for science’s sake”. Taub argues that one of the poet’s main concerns is to promote the study of natural phenomena. While discussing the methodological digression, critics such as Effe 1977: 208 and De Lacy 1943: 173-7 place too much emphasis on lines 273ff., which leads them to conclude that the poet sees scientific investigation as a way to free men from fear. Toohey 1996: 189 makes a similar assumption and even states that the poet “implicitly declar[es] allegiance to Lucretius”. Clearly, the *Aetna* poet is deeply engaged with the *DRN*, and the phrase *iucunda voluptas* in particular evokes Lucretius. The pleasure of intellectual activity, however, is a commonplace (e.g., Arist. *Poetics* 1448b 14ff., Cic. *Leg.* 1.58ff.), and the present passage should not be understood as closely aligning the *Aetna* poet with Epicureanism.

miracula monti, 180), and if the earth were solid, “it would give no wondrous spectacles of itself” (*nulla daret miranda sui spectacula tellus*, 156). In order to grasp the significance of the poet’s strategy here, it is important to realize that few phenomena in antiquity were considered as amazing as Aetna, and that the sense of awe that the mountain produced was closely connected with the literary Aetna topos.⁴³ As early as Pindar, for example, the mountain is “a wondrous marvel to behold, a wonder even to hear from those who were present” (τέρας μὲν θαυμάσιον προσιδέσθαι, θαῦμα δὲ καὶ παρεόντων ἀκοῦσαι, *Pyth.* 1.26). Pindar stresses the wondrous nature of Aetna’s sights and sounds, and reassures his audience that, even if they themselves cannot travel to Aetna and witness its spectacles first-hand, his poetic composition will successfully convey the appropriate sense of awe. Pindar’s poem, in other words, reproduces a volcanic eruption, its words become the fiery flows of lava, its sounds morph into the deafening roars that astound all who hear them.⁴⁴ The author of the treatise on sublimity attributed to Longinus adopts a similar strategy when he presents the mountain as a paradigm of the sublime:

οὐδέ γε τὸ ὕφ’ ἡμῶν τουτὶ φλογίον ἀνακαιόμενον... ἐκπληττόμεθα τῶν οὐρανίων
 μᾶλλον, καίτοι πολλάκις ἐπισκοτούμενων, οὐδὲ τῶν τῆς Αἴτνης κρατήρων
 ἀξιοθαυμαστότερον νομίζομεν, ἧς αἱ ἀναχοαὶ πέτρους τε ἐκ βυθοῦ καὶ ὄλους ὄχθους
 ἀναφέρουσι καὶ ποταμοὺς ἐνίοτε τοῦ γηγενοῦς ἐκείνου καὶ αὐτομάτου προχέουσι πυρός.
 (“Long.” 35.4)

Nor are we more astounded at this little torch that we have kindled ourselves... than at the fires of heaven, although they are often covered with shadows, nor do we reckon it more worthy of amazement than the craters of Aetna, whose eruptions send forth rocks and whole hills from its depths and sometimes pour forth rivers of that earthborn and spontaneous fire.

⁴³ Note that Sicily as a whole was also considered a particularly wondrous place. Witness Nymphodorus of Syracuse’s 3rd century BCE paradoxographical treatise dedicated entirely to the island (Περὶ τῶν ἐν Συκελίᾳ θαυμαζομένων = *FGrH* 572 F 1-3), and note such passages as Lucretius 1.726-7 and Seneca *NQ* 4a 1.1.

⁴⁴ Cf. Billault 2004: 196, who notes that Pindar describes the eruption for a listener “qui, s’il ne se trouve pas dans le même cas [i.e., cannot be an eyewitness to an eruption], a néanmoins toute raison d’être émerveillé par ce qu’il entend”.

Like the stars, Aetna does not always reveal its wonders, and often its sublimity remains hidden. But unlike the stars that burn safely at a distance, the mountain threatens to explode here on earth and to unleash at any moment its deadly “earthborn” fires, an oblique allusion to Zeus’ vanquished foes.⁴⁵ Like Pindar, Longinus actuates Aetna’s sublimity through his own words, and his text is in some sense performative—the reader experiences the sublime of the natural phenomenon by reading Longinus’ sublime description of that phenomenon.⁴⁶ To return to the point at issue, as an exceptional source of wonder and amazement, the mountain provides the scientist with an ideal chance to showcase his intellectual powers and to render both intelligible and harmless one of the most astonishing of natural phenomena. As we will see, this is precisely what the *Aetna* poet does, albeit from a very particular perspective. Instead of attempting to eradicate the sense of awe or terror that Longinus’ mountain inspires, the poet harnesses its traditional grandeur and uses the tools of scientific inquiry to construct out of the mountain a new kind of sublime spectacle, one at which his audience will be able to marvel without recourse to supernatural mythologies and without any inherent danger. Although it retains its traditional status as a *τέρας* or *miraculum*, the mountain also becomes domesticated and entertaining. Like Pindar and Longinus, the *Aetna* poet brings the mountain to his audience, and yet his text reconfigures the mountain’s sublimity from a very unique perspective.

⁴⁵ Billault 2004: 202-3, however, rightly emphasizes the Longinus in fact de-mythologizes the mountain and creates a sort of cosmic aesthetic where the elements and natural phenomena take center stage.

⁴⁶ Billault 2004: 201 notes that Longinus’ account of the mountain contains echoes of the eruption narratives of Pindar and Aeschylus; Longinus is clearly aiming for the sublime.

We can see this clearly in a key passage. While listing several theories that could account for the development of winds beneath the mountain (282-300), the poet draws a comparison with an unidentified musical instrument and then with the water organ:⁴⁷

aut, veluti sonat † ora duc † Tritone canoro
 (pellit opus collectus aquae victusque moveri
 spiritus et longas emugit bucina voces)
 carmineque irriguo magnis cortina theatri
 imparibus numerosa modis canit arte regentis,
 quae tenuem impellens animam subremigat unda,
 haud aliter summota furens torrentibus aura
 pugnat in angusto et magnum commurmurat Aetna. (293-300)

... or, just as ... sounds with the sonorous Triton (the pool of water and the air that is compelled to move strike the machinery and the trumpet bellows forth its long-drawn notes) and in great theaters the water organ with its watery song, melodious through pipes of unequal length, sings due to the art of its controller, which strikes slender currents of air and causes a rowing motion in the waves below—in no way differently does the raging breeze, set in motion by the streams, fight in the confined space, and Aetna makes a great murmur.

By comparing the mountain with musical instruments, the poet momentarily turns Aetna into a complex piece of machinery—it is something that can be assembled, disassembled, and understood.⁴⁸ The precise nature of the Triton contraption remains unclear, and several critics have suggested that it formed part of a water-clock or *horologium*.⁴⁹ But if we read *hora duci* for *ora duc* and translate “just as the hour of battle [*hora*] is sounded to the general [*duci*] by the trumpeting tones of Triton”, then a very close parallel may be found in Suetonius’ biography of

⁴⁷ Garani 2009: 112-15 offers a very different but complementary reading of this passage, emphasizing its Roman color and scientific novelty.

⁴⁸ The language itself is not technical. By comparison with Vitruvius’ highly specialized chapter on water organs (10.8), discussed below, the present passage appears essentially non-specialized.

⁴⁹ E.g., Ellis 2008 (1901): 140-1. Goodyear 1965: 157 states “There seems to be no definite evidence for the use of a Triton as part of a water-clock”.

Claudius.⁵⁰ There, Suetonius describes an astounding *naumachia* staged by the emperor at Lake Fucinus in which a musical Triton played a key role: “at this spectacle a Sicilian and Rhodian fleet clashed, each numbering twelve triremes, when they were set in motion by a silver Triton and its trumpet, which had risen from the middle of the lake by means of a mechanical device” (*hoc spectaculo classis Sicula et Rhodia concurrerunt, duodenarum triremium singulae, exciente bucina Tritone argenteo, qui e medio lacu per machinam emererat*, 21.6). If the *Aetna* poet has this kind of Triton in mind, with its melodious *bucina*, then the mountain suddenly becomes an astonishing piece of machinery that could figure prominently in imperial spectacles—it will enthrall and entertain the reader.

This seems all the more likely when we consider that the second half of the simile compares the mountain to a water organ or *hydraulus*. Although *cortina* does not elsewhere refer to water organs, Ellis has shown quite clearly that this is its meaning here.⁵¹ What matters for us is that the poet connects the instrument quite closely with public performances in the theater (*magnis cortina theatris*). We know from Petronius that a water organist could perform during gladiatorial shows (*ad symphoniam gesticulatus ita laceravit obsonium ut putares essedarium hydraule cantante pugnare*, *Sat.* 36), and Suetonius’ biography of Nero contains a story in which the emperor examined and explained the workings of a collection of previously unknown types of water organ and then explicitly promised to display them in the theater (*se etiam prolaturum omnia [sc. organa hydraulica] in theatrum affirmavit*, 41.2; cf. 54). From this perspective, the water organ constitutes a familiar kind of musical instrument that has close

⁵⁰ The emendation is Munro’s; see Ellis 2008 (1901): 140, whose translation I give here. Although he obelizes the phrase, Goodyear 1965: 157 dubs *hora* the “obvious correction”. Scaliger’s *aura diu* also gives good sense and would not necessarily undermine my interpretation of the passage; the key lies in the Triton contraption.

⁵¹ Ellis 2008 (1901): 141-5.

connections with spectacular displays. If we consider technical accounts of the *hydraulus*, the device appears even more wondrous and amazing. Vitruvius, for example, devotes an entire chapter of the *De Architectura* to water organs (10.8). He describes the workings of the device as obscure and difficult to understand, but emphasizes that anyone who acquires first hand knowledge of the instrument will see that it has been constructed with great ingenuity and precision (*profecto inveniet curiose et subtiliter omnia ordinata*, 10.8.6). Another detailed account of the *hydraulus* appears in Heron of Alexandria's *Pneumatica* (pp. 192-202 Schmidt). In the introduction to that treatise, Heron tells the reader that all the scientific devices he describes fall into two categories, those that fulfill some sort of necessary function and those that make an epideictic display of the astounding and the marvelous (ἐκπληκτικόν τινα θαυμασμὸν ἐπιδεικνύμεναι, p. 2 Schmidt). The water organ clearly falls into the latter category, and elsewhere Heron explicitly characterizes the contents of his work as spectacles (θεωρήματα γράψομεν) and varied and wondrous kinds of movements (πάνυ ποικίλας καὶ θαυμασίας κινήσεις, p. 28 Schmidt).⁵² A comparison with the water organ, then, makes Aetna just the type of breath-taking contraption to figure in Heron's mechanical notebooks. As a musical Triton or sonorous *cortina*, Mt. Aetna is both spectacular and familiar. It constitutes a marvelous wonder that operates according to readily accessible scientific principles and therefore can supplant the falsely constructed and erroneously explained mountain of the literary tradition.

⁵² In his discussion of the scope and branches of mechanics, Geminus fr. 2 p.116 Aujac (= Proclus *In Euc.* pp. 38ff. Friedlein) mentions the field of "wonder making" (ἡ θαυματοποιική). He divides the products of this field into several categories, the first of which uses wind or air, like the devices described in the treaties of Ctesibius and Heron (ὥσπερ καὶ Κτησίβιος καὶ Ἡρώων πραγματεύονται). Whether or not the terminology and references go back to Geminus (cf. Aujac 1975: 167), it is clear that later writers could consider the *Pneumatica* as a whole to be about the construction of wondrous marvels. For Ctesibius, see further below.

Other passages confirm that the poet conceives of Aetna as a kind of modern scientific marvel, and we will consider three examples. First, in the water organ simile the poet alludes to the skill of the musician who actually operates the instrument (*cortina... canit arte regentis*, 296-7). Elsewhere in the poem, it appears that Aetna's fires have their own skilled artist (*artificem incendi*, 188) or wondrous craftsman who actually directs or oversees a carefully orchestrated eruption (*nec tamen est dubium... quis mirandus tantae faber imperet arti*, 197-8). Such metaphors personify the workings of the mountain in a very specific way, assimilating its activity to technical processes that are both well-regulated and amazing.

Second, while describing the constrained and precipitous movements of the *spiritus* that rushes towards the mountain's crater and thereby unleashes an eruption, the poet employs a suggestive simile:

quacumque iter est, properat [sc. spiritus] transitque moramen,
donec confluvio, veluti siphonibus actus,
exilit atque furens tota vomit igneus Aetna. (326-8)

wherever the path lies, [the *spiritus*] hastens and passes through [all] impediments, until, at the place where [other currents of *spiritus*] meet, as if compelled by pumps, it leaps forth and vomits furiously and with fire all over Aetna.

The point of the comparison is that erupting *spiritus* climbs to such heights and moves with such power that it resembles jets of water forced out through pumps. As Munro suggests, the pumps in question are those used for putting out fires, which could send water to great heights.⁵³ Much like the Triton contraption and the water organ, these devices constituted wondrous or amazing marvels. Not only does Heron describe them at length among his other scientific spectacles (*Pneum.* pp. 130-6 Schmidt), but Vitruvius also offers a detailed account (10.7). At the

⁵³ Cited by Ellis 2008 (1901): 151. A similar use of *sipo* in a simile occurs at Sen. *NQ.* 2.16. A propos of that passage, Vottero 1989: 312 declares that "L' esempio è commune negli scrittori tecnici" and cites *Aetna* 328, Columella 3.10.12, 9.14.15, and Pliny 2.166 and 32.124. Cf. Pliny *Ep.* 10.33.2, Ulpian *Dig.* 33.7.12.18, and Isidore *Orig.* 20.6.9.

conclusion of this narrative, the architect characterizes such pumps as just one of the many remarkable inventions of Ctesibius that charm and delight the senses (*nec tamen haec sola ratio Ctesibii fertur exquisita... quae delectationibus oculorum et aurium usu sensus eblandiantur*, 10.7.4). Once again, a striking simile turns Aetna into a stunning piece of technical craftsmanship that utilizes modern scientific knowledge.⁵⁴

Third, in the Triton simile the author notes that sound is produced when water and air strike the “machinery” (*opus*, 294). Numerous passages throughout the poem associate Aetna with the noun *opus*, and even though it is tempting to translate *opus* abstractly as the workings or activities of the mountain, many of these passages clearly suggest a more concrete meaning and so characterize Aetna as an actual piece of work that has been carefully or methodically built—it is a machine, a device, a contraption. In the proem, for instance, the poet declares that he will sing about “the movements that so great an *opus* has” (*qui tanto motus operi*, 25). Later, while noting that the volcano’s flames make it difficult to approach the mountain, he states “that *opus* has fire as its guard” (*custodiaque ignis | illi operi est*, 193-4). In the methodological digression, the poet does not wish “to pass over so great an *opus* at our feet” (*tantum opus ante pedes transire*, 256), and even clouds are said “to look out on high at the *opus* and its vast recesses” (*nubes | prospectat sublimis opus vastosque recessus*, 334 + 336). All of these passages transform the mountain into a mechanical device, and even though they do not characterize it as

⁵⁴ Ironically, the poet likens the explosion of *spiritus*, which ignites the fiery lava-flow, to powerful jets of water that are used to extinguish fires. However, ancient writers, including the *Aetna* poet, regularly use the language and imagery of water to describe volcanic eruptions. The preceding lines, for example, compare the flow of *spiritus* to enormous waves (320-2). In Greek, lava is regularly said to flow (ρέω), and ῥύαξ regularly denotes the actual stream of burning lava. Wolff 2004: 83 reflects on the poet’s use of the four elements and notes the relative absence of water in the poem. Water, however, is not absent; the fiery lava flow continually plays the role of water, and this may also reflect Stoic ideas about the four elements changing from one into another. For this theory and the *Aetna* in a different context, see Volk 2005a: 76-7.

specifically wondrous or amazing, the larger context of the poem suggests just this. The following passage is instructive in this regard. After explaining the nature and activity of the *lapis molaris*, the poet complains that certain readers may still cling to a *fabula mendax* (511) according to which some other substance or combination of substances are liquefied by the fire and so make up the lava-stream:

nam posse exusto cretam quoque robore fundi,
 et figulos huic esse fidem, dein frigoris usu
 duritiem revocare suam et constringere venas.
 sed signum commune leve est atque irrita causa
 quae trepidat: certo verum tibi pignore constat. (515-9)

For you say that clay too can be melted, its solidity burned up, and that potters are the proof of this, and that then, through contact with the cold, it summons back its hardness and contracts its veins. But [this] common piece of evidence is insubstantial and [this] explanation is invalid and uncertain: the truth is established for you by a sure token.

The point of the comparison is that clay does not melt uniformly, so perhaps the lava-stream might not be uniform as well.⁵⁵ What matters for us, however, is that the poet rejects a line of argument that likens the workings of the mountain to something as unimpressive and ordinary as the production of ceramics. He emphatically calls the comparison a *signum commune*, which Goodyear glosses as an “analogy from everyday life”, and promises to produce more compelling evidence.⁵⁶ The mountain thereby retains its spectacular mechanical nature and does not run the risk of becoming a commonplace phenomenon familiar from operations of everyday artisans.

⁵⁵ Ellis 2008 (1901): 200 paraphrases the comparison thus: “just as when potter’s clay is submitted to the action of a furnace, it has an inner substance which fuses, distinct from the rest”.

⁵⁶ Goodyear 1965: 193. Ellis 2008 (1901): 201, following Sudhaus 1898: 195 and later expanded upon by De Lacy 1943: 175-7, explains that a *signum commune* is the Latin equivalent of a κοινὸν σημεῖον, “a sign which has more than one application”. The expression *signum commune*, however, does not appear to occur elsewhere and seems unlikely to be a technical term; Goodyear’s explanation makes more sense.

From this perspective, Aetna is a well-regulated machine that amazes and astounds large audiences. Thanks to the traditional tools of scientific inquiry, its workings can be accurately described and its explosions can be safely exhibited. This brings us back to Pindar and Longinus. Pindar and Longinus bring the spectacle of Aetna to their audiences, turning the words and sounds of their compositions into the fiery debris and deafening shockwaves that the mountain spews into the Sicilian countryside. The *Aetna* poet does just this. As he states at opening of the work, *Aetna mihi... carmen erit* (1-4). Although this certainly means “the subject of my poem will be Aetna”, it literally means “Aetna will be my poem” or, conversely, “my poem will be Aetna”. The poem itself becomes the mountain—it sounds are those of the “sonorous” Triton (*Tritone canoro*, 293), its flowing verses are the “wet song” of the water organ (*carmine... irriguo*, 296). At the same time, the poet becomes the skilled worker who actually runs the Triton, the musician whose “art” allows the *cortina* to “sing” (*canit arte regentis*, 397), the technician who operates the *sipo*, setting the machine in motion through the pages of his poem. That ancient poems were regularly referred to by their first word or words only reinforces the point; we call the composition “Aetna”, and this is what it is. The scientific poet, then, truly does create order in the natural world—he works his instrument and, through the mountain, produces the musical harmonies of poetry. Of course, neither the mountain nor the poem any longer resembles Pindar’s mythological τέρας or Longinus’ exemplum of dangerous ὕψος. The poet’s scientific analysis strips the mountain of this aspect of the sublime and turns it into a more benign form of entertainment, either a smoothly running machine or an actual poetic text. This representation of the mountain may not be as far-fetched as it initially sounds. Imperial spectacles regularly presented audiences with stunning examples of technological creativity, and Strabo actually describes an execution during which a Sicilian rabble rouser associated with the

area around Aetna was placed on top of a massive contraption (πήγμα) built to resemble the mountain (ἐπὶ πήγματος γὰρ τινος ὑψηλοῦ τεθεις ὡς ἂν ἐπὶ τῆς Αἴτνης)—at the appropriate time, the contraption collapsed and both it and the prisoner fell into the fragile cages full of wild beasts that had been strategically placed below (Strabo 6.2.6 C273).⁵⁷ Readers of the *Aetna* will have been familiar with a variety of technically complex devices designed for just such shows, and our poet's conception of the mountain may have seemed quite plausible. Moreover, by the middle of the first century CE Aetna had become something of a tourist attraction—it appears that visitors regularly scaled the mountain, and Strabo reports that the town of Aetna marked the point of departure for those wishing to make the climb (πλησίον δὲ τῶν Κεντορίπων ἐστὶ πόλισμα ἢ μικρὸν ἔμπροσθεν λεχθεῖσα Αἴτνη τοὺς ἀναβαίνοντας ἐπὶ τὸ ὄρος δεχομένη καὶ παραπέμπουσα· ἐντεῦθεν γὰρ ἀρχὴ τῆς ἀκρωρείας, 6.2.8 C273).⁵⁸ As an actual tourist destination, Aetna was a real life spectacle, and the poet vividly brings that spectacle back to Rome in the pages of his poem. By leaving Pieria and literally going to the mountain (5-8), the poet partakes in this kind of sightseeing expedition. Even though scientific inquiry itself seems to serve no useful purpose, the poet provides his readers with a valuable service, saving them the trouble, and the cost, of

⁵⁷ For this particular contraption and others like it, see Coleman 1990: 51-4. As Coleman notes, *SHA Car.* 19.2 mentions a *pegma* that actually involved fire and accidentally burned down the stage. In his discussion of different kinds of *artes*, Seneca counts the inventors of *pegmata* as practitioners of the *ludicrae artes*, those that attempt to please the eyes and ears (*Ep.* 88.22), much like the inventions described at length by Heron.

⁵⁸ See Taub 2009: 136-7 for discussion and further bibliography. Seneca suggests that Lucilius might journey to the summit (*Ep.* 79.2), and we know that at a later date the emperor Hadrian did just that (*SHA Had.* 13.3).

having to travel to Aetna themselves. This is the mountain, correctly explained and impressively displayed, that will supplant the lies of the *vates*.⁵⁹

3. Reinventing the Aetna Topos

The poet, then, promotes a vision of scientific discourse that puts nature in its proper place. Using the appropriate theoretical tools, the scientific investigator constructs a smoothly running machine out of the natural world and rationally explains its countless *miracula*. It is my contention, however, that the poet destabilizes this representation of scientific inquiry and questions its ultimate efficacy by continually associating the mountain with dangerous unpredictable forces and reinvesting it with literary and mythological significance. As the poem progresses, it presents the reader with a collection of miniature eruptions—such threatening episodes figure prominently in the poem’s introduction and constitute the heart of the literary Aetna topos. But these eruptions also punctuate the scientific sections of the work, like a series of tremors or shock waves. This seismic activity builds up gradually only to explode once and for all at the end of the poem, demonstrating the vitality of the literary tradition and scientific inquiry’s inability to silence it.

Before we consider how the poet reintroduces the Aetna topos into his text, it is necessary to recognize that in the poem the natural world in general and the mountain in particular continually resist the scientist’s attempt to create order. According to the poet, our surroundings

⁵⁹ Cf. Leroux 2004: 66 on Sil. It. 14.58-69. She argues that Silius’s Aetna constitutes not a danger or a threat, but a curiosity. It is tempting to connect Silius’ mountain with his contemporaries’ interest in taking sightseeing trips to Aetna. It is interesting to observe that the only other Latin text devoted to Aetna is Pietro Bembo’s *De Aetna*, a dialogue with scientific and philosophical content in which Bembo describes an ascent up the mountain undertaken in July 1493; see Wolff 2004: 84.

present “chaos and ruin without end” (*chaos ac sine fine ruina*, 139), and “nothing comes into being that cannot be overcome” (*nihil insuperabile gigni*, 538).⁶⁰ The natural world is fundamentally disorganized and unstable, and the scientist will have an exceedingly difficult task. At times, the mountain itself proves no more amenable to scientific analysis. The poet, for instance, continually characterizes the mountain as sacred (*sacer*) or divine (*divinus*)—it exists above and beyond the human realm, and burns with a fire that resembles the fires of heaven rather than those that we use here on earth (*hic non qui nostro fervet moderatior usu, | sed caelo propior*, 558-9).⁶¹ The mountain is also especially violent, and the poet repeatedly describes the processes of an eruption with martial metaphors and similes: *spiritus* is the commanding officer that orders the forces of fire (*qua spiritus imperat, audit; | hic princeps magnoque sub hoc duce militat ignis*, 217-8); when ejected rocks attempt to fight the flames, they fall victim to the opposition like a defeated army (*haud aliter quam cum laeto devicta tropaeo | prona iacet campis acies et castra sub ipsa*, 473-4); the *lapis molaris* cannot stand up to the enemy forces of the flames (*nec saevum durat in hostem: | vincitur*, 552-3).⁶² It is hard to imagine scientific analysis creating an orderly universe out of such contentious and restless entities. From this perspective, the following passage is particularly instructive:

Aetna sui manifesta fides et proxima vero est.
 non illic duce me occultas scrutabere causas;
 occurrent oculis ipsae cogentque fateri.
 plurima namque patent illi miracula monti:
 hinc vasti terrent aditus merguntque profundo,
 porrigit hinc artus penitusque exaestuat intra,

⁶⁰ The poet attributes the phrase *nihil insuperabile gigni* to Heraclitus. Goodyear 1965: 198 considers the authenticity of this attribution “highly unlikely”.

⁶¹ Volk 2005a: 78 discusses the use of epithets such as *sacer* and *divinus* to effect “eine Vergöttlichung des Ätna”.

⁶² Cf. Goodyear 1984: 360-1, Wolff 2004: 82, and Garani 2009: 108, 119-20.

hinc scissae rupes obstant discordiaque ingens. (177-83)

Aetna is clear proof of itself and closest to the truth. You will not probe its hidden causes with me guiding you there; they themselves will meet your eyes and compel you to admit it. For a great many wonders can be seen on that mountain: on this side enormous openings terrify and sink into the deep, on that it stretches out limbs and deep inside it blazes, on that broken cliffs and enormous discord bar access.

As we have already seen, the poet insists that Aetna itself wants to be known and that careful observation will lead to sure knowledge. And yet, the mountain's inherently dangerous nature undermines this kind of positivistic rhetoric. In opposition to the easily anatomized spectacle of the water organ, these *miracula* pose a grave threat that refuses to be catalogued or understood and that eventually morphs into an inapproachable and hence incomprehensible *discordia ingens*. It is precisely through descriptions of the mountain's discordant nature that literary tradition and mythological narrative begin to work their way back into the text and militate against the imposed orderliness of scientific discourse.

This tension becomes readily apparent in the first of these miniature eruptions. At the beginning of his discussion of *spiritus*, the poet explains that it is not possible to inspect the mountain physically and to remain safe (*res oculos ducent, res ipsae credere cogent; | quin etiam tactu moneant, contingere tuto | si liceat*, 191-3), but reassures the student that he will be able to observe the mountain's processes from afar (*eadem procul omnia cernes*, 196). Although the poet remains optimistic, the threat that Aetna poses and the danger involved in rational investigation inevitably undercut the work's positivistic rhetoric. This becomes even clearer when the mountain actually erupts:

pellitur exustae glomeratim nimbus harenae,
 flagrantes properant moles, volvuntur ab imo
 fundamenta, fragor tota nunc rumpitur Aetna,
 nunc fusca pallent incendia mixta ruina.
 ipse procul tantos miratur Iuppiter ignes,
 neve sepulta novi surgant in bella gigantes,

neu Ditem regni pudeat, neu Tartara caelo
 vertat, in occulto † tantum tremit omniaque extra
 congeries operit saxorum et putris harenae. (199-207)

A cloud of scorched sand is driven out ball-like, flaming masses rush, the foundations are rolled forth from the bottom, now a crash breaks forth all over Aetna, now conflagrations mixed with dark debris burn pale. Jupiter himself wonders at such great fires from a distance, lest new giants rise up for wars that have been buried, lest Dis grow ashamed of his realm and exchange Tartarus for heaven, in secret ... covered by a heap of stones and powdery sand.

At one level, this passage presents a standard example of the literary Aetna topos. In addition to simply describing an eruption, there are reminiscences of other examples of the topos. *Glomeratim*, for instance, recalls *saxa... glomerat* at *Aen.* 3.576-7, and *volvuntur ab imo | fundamenta* suggests *fundoque exaestuat imo* at *Aen.* 3.577.⁶³ For our purposes, however, I want to emphasize three points. First, Aetna's eruption breaks apart or even inverts the order of the natural world. The lowest foundation of the mountain is driven sky-high, its physical interior becomes externalized, and fire consumes the landscape. The order imposed by scientific analysis seems to explode.⁶⁴ Second, the poet does not hesitate to situate this eruption within a mythological and literary context. By mentioning Jupiter and his battle with the giants, the poet prompts the reader to think about other instances of the Aetna topos and to conceive of the mountain in literary terms. This maneuver implies the veracity of the gigantomachy myth and further undermines the poet's purely scientific account of the mountain.

Third, this mythological scene actually dramatizes an attempt at scientific inquiry. Since the 4th century BCE, the gigantomachy had served as a metaphor for improper or misguided

⁶³ Sudhaus 1898: 14 and Vessereau 1923: 63 provide further parallels.

⁶⁴ Apropos of Pindar *Pyth.* 1, Billault 2004: 197 notes that, whereas Zeus' victory over the giants is supposed to create order, "le volcanisme de l'Etna doit apparaître comme un désordre. Pindare le représente comme tel en décrivant la confusion des éléments qu'il provoque". Billault then reads this situation from a political perspective.

intellectual inquiry—the giants’ assault on the gods represents the wayward investigations of foolish or even sinister intellectuals.⁶⁵ Here, the situation is reversed, and Jupiter plays the role of the unfortunate scientist. Like the student who must watch Aetna at a safe distance (*eadem procul omnia cernes*), Jupiter gazes at the mountain from afar (*ipse procul tantos miratur Iuppiter ignes*). Jupiter’s activity, however, does not lead to any kind of scientific understanding. Ostensibly, the student will observe and understand the events unfolding before him (*cernes*). Jupiter experiences something very different. Instead of observing and understanding, the god merely wonders (*miratur*), and is then plunged into a state of anxiety and fear (*neve sepulta novi surgant in bella gigantes...*). This figure contrasts markedly with the Jupiter who figures in other examples of the Aetna topos, particularly the Jupiter that the *Aetna* poet describes in the proem.

There, Jupiter’s initial fear immediately gives way:

Iuppiter et caelo metuit dextramque coruscam
 armatus flamma removet caligine mundum.
 incursant vasto primum clamore gigantes.
 hinc magno tonat ore pater geminantque faventes
 undique discordi sonitum simul agmine venti;
 densa per attonitas rumpuntur fulmina nubes... (54-9)

Jupiter fears for heaven and, having armed his gleaming right hand, removes the sky from darkness. First the giants attack with an expansive shout, then the father thunders with his great mouth and the winds double the sound, supporting him together in a discordant band from every direction; through thunderstruck clouds lightning bolts break forth in throngs...

Jupiter demonstrates his authority by marshalling and then deploying the forces of nature against his assailants, and it is implicitly his assailants who, like the lying *vates*, conduct their inquiries improperly. Unlike this figure, the Jupiter of 199 to 207 seems helpless and aloof. His

⁶⁵ See Volk 2001: 102-6.

understanding of the explosion does not operate within the poet's theoretical framework and he himself constitutes a troubling image of the would-be scientist.⁶⁶

This type of tension, I suggest, does not occur accidentally. Throughout the poem, miniature eruptions such as this continue to emphasize the danger and instability of the natural world and to connect the mountain with literary history. These volcanic explosions occur side by side with passages of scientific analysis—science, however, will not have the final say. This brings us to the poem's epilogue. After succinctly summarizing his volcanic theories (565-7), the poet runs through a list of culturally significant locales, famous from poetry and art both old and relatively new (568-98). Like the Aetna narratives with which the work begins, the stories associated with cities such as Thebes and Troy constitute the “the lies of old rumor” (*veteris mendacia fama*, 571). The poet quickly grows indignant:

haec visenda putas terrae dubiusque marisque?
 artificis naturae ingens opus aspice, nulla
 † cum tanta humanis phoebus spectacula cernes
 .
 praecipueque vigil fervens ubi Sirius ardet.
 insequitur miranda tamen sua fabula montem,
 nec minus ille pio † quamquam sors † nobilis igni est. (599-604)

Do you think these [places and objects of art] are to be visited and [yet] remain doubtful about the earth and sea? Behold the huge work of the artist nature, none ... and especially where wakeful Sirius boils and burns. Nevertheless, its own wondrous story follows the mountain, nor is it less noble ... the pious fire.

These lines criticize those individuals who eagerly consume literary and mythological narratives but refuse to devote themselves with equal diligence to the study of the natural world (*terrae dubiusque marisque*)—fun-loving tourists and lying poets should reconsider their priorities. At the same time, however, these lines also reclaim Aetna for the literary and mythological tradition. Despite its status as a paradigm for the proponents of rationalism, the mountain still

⁶⁶ Cf. Effe 1977: 211-12, who compares both passages and calls the second ironic.

(*tamen*) thrives in the world of the poetic (*fabula*), and its literary identity does not diminish its prestige (*nec minus... nobilis*). What follows is an extended volcanic ecphrasis that far outstrips in length, intensity, and pandemonium all other examples of the Aetna topos.

Once upon a time, we are told, Aetna erupted with such force that it threatened the town of Catana and killed almost all of its inhabitants. This narrative has a long history, appearing first in Lycurgus (*In Leocr.* 95-6). According to the version followed by the *Aetna* poet, the only survivors were two brothers who raised their aged parents up on their shoulders and successfully carried them to safety—as they ran, the flames miraculously parted and allowed the family to escape.⁶⁷ In its present context, this story reinvents the Aetna topos and complicates the scientific thrust of the poem in three significant respects. First, it is striking that this eruption does not simply send torrents of molten lava into the empty air or ravage the uninhabited slopes of the mountain. Here, at the end of the poem, Aetna's irrepressible ferocity is unleashed on a human community:

ardebant agris segetes et mitia cultu
iugera cum dominis, silvae collesque ruebant;
vixdum castra putant hostem movisse tremendum,
et iam finitimae portas evaserat urbis. (610-13)

The crops in the fields and the acres, rendered complaisant through cultivation, were burning along with their masters, the woods and the hills were turning red; scarcely do they think that the awe-inspiring enemy has moved its camp, and already it has overrun the gates of the nearby city.

⁶⁷ For a full list of sources, see Wissowa 1894. Note that some sources mention only one brother and one parent (e.g., Lyc. *In Leocr.* 95-6.). Taub 2009: 137-41 discusses and reproduces images of coins, mostly from Catana, that depict the brothers carrying their parents. Conon *FGrH* 26 F 1 XLIII says that the Sicilians erected statues of the brothers to commemorate the deeds of both the gods and men (cf. Claudian *Carm. min.* 17), and Pausanias 10.28.5 relates that the brothers were still being honored by the Catanians even in his day. Although the eruption is usually dated to ca. 693 BCE (e.g., Romano and Sturiale 1982: 89; Stothers and Rampino 1983: 6366; Chester, Duncan, Guest, and Kilburn 1985: 96; and cf. Siebert, Simkin, and Kimberly 2010: 52), in the absence of any corroborating physical evidence I see no reason to suppose that the story has any connection with an historical eruption.

Like an invading army, the mountain's fires destroy everything in their way. The flames will be sparing to none, and no amount of scientific knowledge can stop this literary explosion—Aetna can erupt at any time. This image of the mountain runs counter to its characterization as a scientific marvel or machine. In those passages, scientific theory domesticated Aetna and turned it into public entertainment. Here, Aetna resists all attempts at control, and its processes, although still scientifically understood, unleash their full force on the audience.

Second, the scene allows the reader to interpret the mountain within an ethical framework. As Leroux argues, Latin poetry often uses Aetna symbolically or even allegorically to make moral points, most of which connect the mountain's eruptions with some kind of violent or improper behavior—"Image du *furor* amoureux dans la *Phèdre* de Sénèque," for example, "l'Etna symbolise dans l'épopée le *furor* guerrier".⁶⁸ In the *Aetna* poem, the lesson is slightly different. Amidst the sea of greedy fools (*avaros*, 621) who weigh themselves down with material possessions and fall victim to the greedy fire (*avidus... ignis*, 640), four individuals, as we have seen, manage to escape. These are two "loyal brothers" (*pii iuvenes*, 634) who each take upon their shoulders one of their parents and before whom the destructive flames recede in shame (*erubere pios iuvenes attingere flammae* at 634, and *sibi temperat ignis* at 640). The poet explicitly attributes the youths' success to their *pietas* (624), "the greatest of goods, rightly [considered] the virtue that most brings safety to man" (*o maxima rerum | et merito pietas homini tutissima virtus*, 632-3). Furthermore, he dramatically implores the other Catanians to set aside their material possessions and to follow the example of the brothers (*parcite, avara manus, dites attollere praedas: illis divitiae solae materque paterque*, 629-30), and notes that Ditis rewarded the brothers handsomely for their actions (*illos seposuit claro sub nomine Ditis*, 643).

⁶⁸ Leroux 2004: 67.

Other sources regularly emphasize the brothers' *pietas* or εὐσέβεια, framing the entire narrative as an *exemplum* about the proper attitude one should have or behavior one should exhibit towards one's parents and/or the gods. Significantly, the contrast between *pietas* and *avaritia* recalls the earlier diatribe against mining and agriculture, and suggests a contrast with the impious *vates* who misrepresent the nature of the gods.⁶⁹ At the work's conclusion, this contrast establishes an ethical leitmotif that ties the poem together. But in contrast to other symbolic instances of the topos, the point is not the mountain's dangerous or morally unacceptable *furor*. Rather, the mountain seems to consume those who deserve it, and to spare the few who have done no wrong. In its present context, however, this lesson about loyalty, religiosity, and some sort of volcanic justice comes as quite a surprise. The story of the *pii iuvenes* fills the natural world with moral purpose and direction. The poet does not simply anthropomorphize the lava through a simile or metaphor, but rather makes it fully intentional and aware—the flames feel shame at the prospect of killing such morally upright individuals.⁷⁰ In the rest of the poem, the natural world behaves mechanically and follows physical laws—here, the flames violate those laws, receding either of their own accord or due to the god's intervention. Significantly, other sources recognize the implausibility of this narrative. Lycurgus, for example, expressly distances himself from the events that he recounts (λέγεται γοῦν ἐν Σικελίᾳ...) and admits that it is the stuff of myth (εἰ γὰρ καὶ μυθωδέστερόν ἐστιν, ἀλλ' ἀρμόσει καὶ ὑμῖν ἅπανσι τοῖς νεωτέροις ἀκοῦσαι, *In Leocr.* 95). From this perspective, the Catana narrative replaces the traditional

⁶⁹ Toohey 1996: 191 also notes the connection with the diatribe against mining and agriculture.

⁷⁰ We have already seen the poet anthropomorphize the earth through a simile comparing it to the human body and through martial similes and metaphors; this kind of maneuver is common in both the poem and other scientific writers. Garani 2009 discusses a number of the *Aetna* poet's anthropomorphisms; see esp. pp. 108-111. Cf. Wolff 2004: 83, who concludes of the mountain, "Bref, c'est un être vivant... presque monstrueux".

mythology of the Aetna topos, which attempts to explain the causes of the mountain's eruptions, with a new kind of poetic *fallacia*. This *fallacia* serves an ethical purpose, reinventing the Aetna topos within a moral framework that both scientific analysis and earlier poetic treatments of the mountain seem to lack.⁷¹

Third, the eruption that overwhelms a greedy city offers the reader a new literary context for understanding the mountain. The *pietas* of the two brothers contrasts markedly with the *impia... fabula* (42) of Enceladus and the countless lies of the *vates*. It also obviously suggests the piety of Virgil's Aeneas. Like the Sicilian youths, *pious* Aeneas famously carries his father to safety on his shoulders through the flames of Troy (*Aen.* 2.624-804). Just as the flames recede before Aeneas (*flammaeque recedunt, Aen.* 2.633), so too do they withdraw before the *pii fratres* (*flammae... cedunt, Aetna* 634-35). And just as Anchises protects the family's *penates* (*Aen.* 2.717 and 747-8), so too the *pii iuvenes* are sure to salvage their household deities (*sua numina secum | salva ferunt, Aetna* 641-2)—this is a detail that other sources do not mention, and it clearly points towards the *Aeneid*. The connection between the *pii iuvenes* and Aeneas may be traditional,⁷² but in its present context, the vivid parallelism between the pious youths and pious Aeneas shifts the poem's focus away from the science of volcanic activity and encourages the reader to think about the fires that ravage Virgil's Troy. In the second book of the *Aeneid*, Virgil

⁷¹ Toohey 1996: 190-2 observes the apparent contradiction in the poem's mythical conclusion and summarizes the implications of the Catana narrative as "a series of simple equations: greed versus the gods, greed versus piety, greed versus family, greed versus volcanoes, greed versus 'science' (this poem), ignorance versus 'science' (this poem), and so on". Volk 2005a: 80-2 reads the episode as part of the poet's enthusiasm for a "Naturanreligion" based on scientific inquiry. De Vivo 1989: 83 suggestively compares the emphasis on brotherly loyalty with Flavian propaganda. Taub 2008: 55 reductively suggests that the poet presents myth as being useful only for relating "human-interest stories"; cf. Taub 2009: 135-7.

⁷² At *Ben.* 3.37 and 6.36, Seneca mentions Aeneas and the two youths side by side. Most ancient sources expressly state that the brothers carried their parents on their shoulders. This is also the way they were depicted on coins; see again Taub 2009: 137-41.

employs a range of words and expressions that the *Aetna* poet reinterprets from the perspective of the Aetna topos. For instance, after the appearance of the shooting star and just before Anchises resumes his position on his son's shoulders, Aeneas tells his Carthaginian audience: "now a louder fire is heard over the walls, and closer by the blaze rolls forth fires" (*iam per moenia clarior ignis | auditur, propiusque aestus incendia volvunt*, 2.705-6). The phrase *aestus incendia volvunt* could well describe Aetna. So, too, as Aeneas searches for Creusa, he notes that "consuming fire is rolled forth by the wind to the tops of the roofs; the flames tower above, the blaze rages into the breezes" (*ignis edax summa ad fastigia vento | volvitur; exsuperant flammae, furit aestus ad auras*, 2.758-9). Again, the language here (*volvitur, aestus*, etc.) mirrors or corresponds quite closely to the language of the Aetna topos. Of course, there is absolutely no reason to think that Virgil himself intends to evoke or allude to this tradition in his account of Troy's fiery collapse. The *Aetna* poet, however, reads this conflagration as a volcanic eruption and thereby redefines the Aetna topos against the greatest "eruption" in Roman literary history. At the same time, he transforms Aetna's most spectacular explosion into a reenactment of the fall of Virgil's Troy. The mountain gains an additional layer of mythological significance, and the *Aeneid* perhaps acquires a touch of scientific theory.⁷³

Although scientific analysis can account for the mountain's inner workings, poetic tradition and innovation give it full meaning and significance.⁷⁴ The poet, however, goes even further. The natural scientist imposes order on the physical world while remaining at a safe distance. But even though such scientists explain the wonders of nature through observation and

⁷³ Volk 2005a: 80 mentions the basic parallelism between the two scenes, reading the *Aetna* poet's depiction of two sons and two parents as an attempt to outdo or one-up Virgil.

⁷⁴ It is worth pointing out that no extant poem prior to the *Aetna* mentions the *pii fratres*; treating the Catana narrative in verse may have been an innovation. Claudian *Carm. min.* 17, titled *De piis fratribus et de statu eorum quae sunt apud Catinam*, runs to 48 lines.

inference, it is the *pii iuvenes* who dart unharmed through Aetna's fiery wreckage and actually become the wondrous subjects of epic poetry:

incolumes abeunt tandem et sua numina secum
 salva ferunt. illos mirantur carmina vatum,
 illos seposuit claro sub nomine Ditis,
 nec sanctos iuvenes attingunt sordida fata:
 securae cessere domus et iura piorum. (641-5)

Unharmed, they leave at last and carry with them their divinities, safe and sound. The poems of the poets marvel at them, Ditis has set them apart under a famous name, nor do base fates touch the sacred youths: they have been granted a home free from care and the rights of the pious.

The brothers seem to displace Aetna itself as the object of wonder and speculation. Unlike the impious *vates* who spread misinformation about the mountain, there are other poets who celebrate the *pii iuvenes* and, implicitly, the true nature of the volcano. Of course, the poet who springs to mind is the author of the now anonymous *Aetna*—he alone correctly explains the mountain's nature from a scientific perspective and then celebrates and expands upon its literary life. By refusing to lie dormant while scientific inquiry imposes a sense of order on the natural world, Aetna itself vividly dramatizes the limitations and interdependence of scientific discourse and literary tradition.⁷⁵

The *Aetna* poet's assessment of the relationship between scientific discourse and literary tradition may not be entirely unique, and Lucan provides an intriguing point of comparison, albeit on a much smaller scale. Although he does not actively promote the study of the natural world or configure such study as source of order and harmony, Lucan does approach natural phenomena from a rational or scientific perspective. As we will see in the following chapter, the poet of the *Bellum Civile* regularly demythologizes natural phenomena and replaces traditional mythological narratives about perplexing or disturbing natural events with scientific analysis. At

⁷⁵ Toohey 1996: 191 implausibly likens the poet to the brothers and the readers to their parents.

the same time, however, a certain tension between familiar literary stories about, and more recent scientific explanations of, natural phenomena occasionally surfaces in the poem, and Lucan's engagement with the Aetna topos provide a particularly striking example.⁷⁶ In Book 1, for instance, the poet briefly mentions an eruption of the mountain during an extensive list of omens that presaged the outbreak of civil war: "fierce Mulciber loosed the mouths of Sicilian Aetna, and the fire did not carry its flames to heaven but fell in a headlong whirl to the side that faces Hesperia" (*ora ferox Siculae laxavit Mulciber Aetnae, | nec tulit in caelum flammam sed vertice prono | ignis in Hesperium cecidit latus*, 1.545-7). Although he puts Mulciber in charge of the mountain's eruption and so follows the Aetna topos closely, Lucan also modifies the topos, emphasizing that the lava did not behave normally and then specifying the direction in which it flowed. This creates the impression of a reliable or even eyewitness report of the eruption, and modern critics have tended to believe that Aetna did in fact erupt on this occasion in the way that Lucan describes.⁷⁷ Although Lucan associates Aetna's fiery explosions with Mulciber elsewhere (10.447-8), the account of the siege at Dyrrachium connects the mountain with Enceladus. When Pompey's troops launch an attack, Caesar's men are terrified: "not thus does the inhabitant

⁷⁶ Cf. Leroux 2004: 72-3, who discusses Lucan's representations of Aetna and argues that they act as metaphors "d'un monde proie à la destruction".

⁷⁷ Given Lucan's tendency to explain the natural world scientifically, it is tempting to treat *Mulciber* as a mere metonymy for "flame"; cf. Egnatius fr. 1 Courtney (= 43 Hollis): *denique Mulciber ipse furens altissima caeli | contingit*, presumably in reference to a volcano. The present passage, however, occurs within a highly mythological context. The previous sentence, for instance, describes Titan hiding his chariot in a cloud and creating a darkness "like the night brought on by Thyestes' Mycenae when the sun fled to the east" (*qualem fugiente per ortus | sole Tyestae noctem duxere Mycenae*, 1.543-4). As for the historicity of the eruption, see Stothers and Rampino 1983: 6367, and Chester, Duncan, Guest, and Kilburn 1985: 96, who simply state that "An eruption, possibly on the W. flank, ... occurred during the civil war between Caesar and Pompey". Petronius *Sat.* 122.135-6 is taken to provide corroborating evidence, although the direction of the lava flow is not specified and the lines read like a much more conventional instance of the topos.

of Henna's valleys tremble at Enceladus when Notus blows and all of Aetna empties its caverns and flows burning into the fields" (*non sic Hennaeis habitans in vallibus horret | Enceladum spirante Noto, cum tota cavernas | egerit et torrens in campos defluit Aetna*, 6.293-5). This simile inscribes the mountain within another familiar literary and mythological framework, and Lucan appears to be one of the lying *vates* whom the *Aetna* poet tries so carefully to undermine. The presence of Notus, however, may suggest a subtle twist. Although Notus can refer either to the anthropomorphic wind-god or simply to the south wind as a natural phenomenon, poets sometimes apply the term to wind of any kind (*OLD* s.v. 1b). If we read Notus in this way, a close connection between blustering winds and a volcanic eruption may imply that Lucan knows of a more scientific account of Aetna's activity, one that traces the origins of its eruptions to violent currents of subterranean air.⁷⁸

This complex picture of the mountain combines literary tradition with scientific analysis and finds expression in another key passage. When Appius goes to Delphi, Lucan contemplates the nature and workings of the oracle. Even though he does not know precisely how the shrine works, the poet formulates a hypothesis:

forsan, terris inserta regendis
aere libratum vacuo quae sustinet orbem,
totius pars magna Iovis Cirrhaea per antra
exit et aetherio trahitur conexa Tonanti.
hoc ubi virgineo conceptum est pectore numen,
humanam feriens animam sonat oraque vatis
solvit, ceu Siculus flammis urgentibus Aetnam
undat apex, Campana fremens ceu saxa vaporat
conditus Inarimes aeterna mole Typhoeus. (5.93-101)

⁷⁸ Cf. Leroux 2004: 62; although she makes a similar suggestion, she does not consider the potential tension implied by *Notus*, which she does not capitalize either.

Perhaps a great portion of the whole of Jupiter [i.e., the *aether* or *spiritus*],⁷⁹ which has been inserted into the earth to guide it and which sustains and balances the world in empty air, exits through the Cirrhaean caves and is inhaled, while [still] joined with the ethereal Thunderer. When this power is received in the virgin's breast, it strikes her human spirit and sounds forth and looses the prophetess' mouth, just as the Sicilian peak undulates when the flames put pressure on Aetna, just as Typhoeus, buried by the eternal mass of Inarime, roars and heats the Campanian rocks.

Despite his uncertainty, Lucan carefully outlines a plausible explanation about the oracle that relies on scientific theories concerning the structure and nature of the earth. Technical and non-technical authors alike regularly describe the earth as spherical and suspended in air,⁸⁰ and both Lucan himself and others, not least of all the *Aetna* poet, posit the existence of subterranean passageways through which air flows and from which it bursts forth in violent explosions.⁸¹ The existence of subterranean air plays a crucial role in the two similes that follow, and these are what we need to focus on. Lucan compares the physical process by which the priestess becomes inspired and then delivers a prediction to volcanic activity, namely, the eruptions of Aetna and the craters of the Phlaegraean Fields.⁸² The basic point of comparison is simple—the priestess'

⁷⁹ Viansino 1974: 82 notes that certain Stoics equate Zeus/Jupiter with *aether* (*SVF* 2.1061, 1066) or *divinus spiritus* (Sen. *Dial.* 12.8.3).

⁸⁰ See, e.g., Cic. *ND* 2.91, *TD* 5.69, Lucr. 2.600-3, Tib. 3.7.151, Ovid *Met.* 1.12-13, Manil. 1.168-214, Pliny 2.10-11. Raschle 2007 amply discusses ancient accounts of the earth's sphericity and Lucan's familiarity with the idea.

⁸¹ See, e.g., Lucr. 6.535-607 and Sen. *NQ.* 6.23-6. Elsewhere, Seneca, like Lucan, raises the possibility that this subterranean air comes from the air that surrounds the earth (*vide ergo num quid intret in illam [sc. terram] spiritus ex circumfuso aere*, *NQ.* 6.14.3). Cf. Schrijvers 2005: 29 on Lucan 3.455-61.

⁸² Mt. Inarime cannot easily be located. At *Il.* 2.780-5, Homer describes the sound the earth made as the Achaean forces advanced, and compares it to the sound the earth makes when Zeus hurls thunderbolts at Typhoeus εἰν Ἀρίμοις, "in Arima". Although some ancient sources assume that the reference is to a tribe called the Arimoi or to a mountain range called τὰ Ἄριμα, both variously located, a number of writers consider Typhoeus to have been placed beneath a volcano, much like Enceladus. Virgil *Aen.* 9.715-6 is the first to place him under Inarime, which derives

noisy stream of words resembles the rivers of fire that issue thunderously from the volcanic locales. It is important to realize, however, that the initial description of the priestess takes for granted Lucan's scientific description of the earth. Like the earth, the priestess has hollow cavities inside her, and when she inhales, the divine air or *numen* becomes trapped inside those cavities. Eventually, this air forces a way out and so causes a great deal of sound as it unleashes a torrent of words. Since it is precisely this process that Lucan illustrates with the volcanic similes, it is implied that the volcanic phenomena in question function in a similar way. This particular version of Aetna, then, behaves much as it does in the anonymous poem—subterranean air moving through hollow spaces violently breaks forth and causes an eruption. That the present passage does not expressly mythologize Aetna's explosion only reinforces the point.⁸³

From this perspective, Lucan employs both mythological narratives and modern scientific analysis when treating the same natural phenomenon—Mulciber and Enceladus may unleash Aetna's terrifying lava stream, but a less fantastic explanation lies ready to hand.⁸⁴ To be sure, Lucan does not thematize this tension, and the *Bellum Civile* does not explore the ways in which literary tradition and scientific analysis can limit or supplement one another.⁸⁵ Although scenes

from reading εἰν Ἀρίμοις as a single word and which is no easier to locate geographically than the Arimoi or the Arima mountains. See West 1966: 250-1 and Hine 2002: 58-9.

⁸³ Some sources associate Typhoeus with both Aetna and Campanian volcanism. Pindar, for example, images Typhoeus to be so large that he causes volcanic activity in both places simultaneously (*Pyth.* 1.16-28), and Lucan may have this kind of scenario in mind, thereby inscribing Aetna within yet another literary and mythological tradition. See Hine 2002: 69-72; at 70 n.39, Hine argues that Pindar associates Typhoeus with Aetna and Ischia, rather than the *Campi Phlegraei* or Vesuvius.

⁸⁴ Apropos of the Pythia, Leroux 2004: 62 says that Lucan associates “explication scientifique et étologie légendaire”. Although I agree with this basic point, her discussion is reductive.

such as these hint at this kind of intellectual approach, Lucan does not pursue the issue. Instead, Lucan's poem repeatedly questions the very idea of writing about scientific topics in verse and continually suggests that the Roman literary tradition of scientific poetry serves no useful purpose at all. Unlike the *Aetna* poet, who proudly advertises the pleasure that one derives from the investigation of nature and who separates that investigation from other more practical pursuits, Lucan vehemently rejects all composers of scientific poetry. We will now consider Lucan on his own and in greater detail.

⁸⁵ Note that Lucan does reproach those who insist that poets only narrate “the truth” and so stay away from mythology. While describing Hercules' theft of the golden apples from the garden of the Hesperides, the poet makes the following statement: “spiteful is he who takes away from aged time its glory, who calls poets to the truth” (*invidus, annoso qui famam derogat aevo, | qui vates ad vera vocat*, 9.359-60). Although this passage does not concern mythological narratives about natural phenomena or the pursuit of scientific inquiry, it does suggest that patently false mythologies possess an unspecified value or serve some kind of purpose.

Chapter 4: Lucan and the Limits of Didactic Poetry

This chapter will examine the representation of didactic poetry and scientific theory in Lucan's *Bellum Civile*. My thesis is that, without questioning the accuracy or precision of the results of scientific inquiry, Lucan continually invites the reader to reconsider the value of poetry as a means of transmitting scientific knowledge about the natural world. Throughout the poem, characters who are familiar with scientific learning seem ineffectual, and the didactic traditions associated with that learning continually appear unable or unwilling to communicate helpful information to those who inhabit the "real world". This kind of poetry emerges as an alternative to Lucan's own brand of epic, one that Lucan conspicuously rejects. Civil war fundamentally undermines the very possibility of utilizing scientific knowledge—it renders didactic poetry itself irrelevant and exposes its limitations.

The natural world figures prominently in Lucan's poem. Similes drawn from nature abound, geographic catalogues are conspicuous, elemental conflicts mirror human conflicts, characters wage war on the environment, and the environment wages war in return.¹ The poet also shows a profound interest in the workings of natural phenomena themselves, quite apart from any symbolic value that such phenomena might possess, and both he and his characters frequently discuss or refer to scientific theories about the natural world and display their own scientific learning.² At the same time, civil war continually threatens to destroy the order and

¹ Loupiac 1998 provides a comprehensive collection of passages dealing with the natural world, but offers little substantial or persuasive analysis. König 1957 and Schönberger 1960 discuss the symbolic value of elemental conflicts. Cf. Gassner 1972, Dinter 2005, and Walde 2007.

² Viansino 1974: 77-101 conveniently compiles many of the most relevant passages and discusses possible sources, but gives little analysis and explicitly decides to consider the passages themselves out of context, "come momenti «meditativi» separati dall'esposizione dei fatti" (p.

harmony of the universe as a whole, and a sense of impending cosmic disintegration permeates the poem, culminating in the cataclysmic battle of Pharsalus.³ After Pompey's defeat and his subsequent assassination, the poem's two surviving protagonists find themselves inexorably propelled towards the edges of the human world, moving from the familiar and well-understood confines of Greece and Rome towards the unknown and eventually the unknowable. As the narrative veers away from the normative spaces of Greco-Roman life towards these liminal environments and the ultimate collapse of the universe itself, poetry seems less and less suited to the task of thinking about and making sense of the natural world. It is here, in Books 9 and 10, I argue, that Lucan's critique of scientific knowledge and scientific poetry reaches a climax. On the one hand, Cato's battle with the Libyan snakes in Book 9 emphatically demonstrates that scientific poetry possesses little or no practical value. In the extreme and hostile expanses of the Libyan desert, far away from the sheltered libraries and crowded recitations of Rome, the natural historical and medical learning of Nicander and the *Theriaca* tradition look like exercises of purely academic interest, entirely divorced from the world they purport to explain. On the other hand, Acoreus' cosmological and meteorological song about the Nile in Book 10 suggests that there may be a radically different kind of scientific poetry. Instead of teaching a simple lesson that leads to knowledge and understanding, Acoreus uses trickery and deceit to confuse his audience and thereby suggestively reinvents the didactic genre as a powerful and paradoxical tool against which readers should be on guard. In a world unhinged by civil war and on the

79). Migliorini 1997: 95-125 discusses Lucan's familiarity with medical theory, Schrijvers 2005 provides a general overview of Lucan's use of natural philosophy, and the essays collected in Landolfi and Monella 2007 touch on various aspects of Lucan's scientific knowledge.

³ Lapidge 1979.

verge of total breakdown, the elegant refinement and bookish learning of didactic poetry seem trivial, inconsequential, or even deceptive.

I will begin by considering the representation of scientific knowledge and didactic poetry in the main body of the poem. In sections two and three, we will follow Cato and Caesar to North Africa, where the poetry becomes an unsuitable means for transmitting scientific knowledge about the universe, and yet where one particular didactic poet emerges as a potentially powerful and dangerous figure. By the end, it will be clear that civil war renders didactic poetry as a genre and the generic persona of the didactic poet either inconsequential or untrustworthy. Lucan suggests that didactic poetry, like epic poetry itself, cannot function according to its familiar norms in a time of civil war.

1. The Reliability and Relevance of the Didactic Tradition

Before we consider Lucan's extended critiques of didactic poetry in Books 9 and 10, it is necessary to examine the generic representation of didactic poetry elsewhere in the poem. The following discussion begins by looking at Lucan's attitude towards scientific knowledge in general, and then investigates his characterizations of cosmological didactic and the Aratean tradition. Although scientific knowledge itself does not appear suspect, the traditions of cosmological didactic and Aratus play rather more ambiguous roles. Three key passages suggest that even though poetry may transmit accurate information about the natural world, such poems may have little to offer those who inhabit a universe embroiled in civil war. This value judgment anticipates the major assault launched on the value and function of scientific didactic in the final two books of the work.

It is well known that Lucan regularly explains natural phenomena in scientific terms. When describing the origins of the flood that inundates Caesar's camp, for instance, Lucan describes the weather conditions and astronomical influences responsible for the deluge (*pigro bruma gelu siccisque Aquilonibus haerens | aethere constricto pluvias in nube tenebat...*, 4.50-1). Critics frequently point out that Lucan replaces the traditional mythological conventions of epic with scientific or natural philosophical causes, and here he conspicuously foregoes the Olympian dramas that set in motion the epic floods and storms of Virgil and Ovid.⁴ Even more frequently, though, Lucan simply takes scientific knowledge for granted.⁵ When plague strikes Pompey's troops at Dyrrachium, the poet does not hesitate to locate the origins of the disease in the interaction between decaying horse carcasses and stagnant air (*corpora dum solvit tabes et digerit artus, | traxit iners caelum fluvidae contagia pestis | obscuram in nubem*, 6.88-90). Ancient accounts of plague frequently associate the disease with contaminated air, and Lucan here invokes that tradition.⁶ Similarly, when Caesar cuts off the Pompeians at Ilerda and they are forced to endure the extremes of dehydration, Lucan remarks that their veins wither and their lungs become stiff and dry and restrict the flow of air (*iam marcent venae, nulloque umore rigatus | aeris alternos angustat pulmo meatus*, 4.326-7). According to ancient medical theory, human *venae* carry blood and air, although more of the former than of the latter, and both food

⁴ See, e.g., Viansino 1974: 79, Lapidge, 1979: 364-7, Lausberg 1990, Berti 2000: 161-2, and Schrijvers 2005: 30-1, 32-3 on Lucan's substitution of scientific *causae* for traditional mythological narratives. For Lucan's refusal to describe the activities of the gods in general, see Feeney 1991: 250-301. For the details of Lucan's floods and storms, see Morford 1967a: 20-58, who discusses this flood at pp. 44-7.

⁵ Cf. Moretti 1985: 143 n.31, who suggests that Lucan's use of the didactic tradition—rather than scientific or technical knowledge in general—leads to “un'analisi del fenomeno storico che utilizzi metodi e mezzi propri all'analisi del fenomeno naturale”.

⁶ See, e.g., Lucr. 6.1096-7, Virg. *Geor.* 3.478-9, and Ovid *Met.* 7.528-9. Migliorini 1997: 105-10 discusses Lucan's use of scientific and medical theories in the plague narrative as a whole.

and drink can circulate within them. Since the Pompeians consume no liquid, their *venae* become dry and enfeebled and are unable to supply the lungs with moisture, thereby preventing the lungs from efficiently circulating air.⁷ It is also important to note that knowledge based on the stars enjoys a privileged position in Lucan's universe, and descriptions of the heavenly bodies and celestial phenomena figure prominently throughout the poem.⁸ In particular, Lucan uses astronomical data as a way to mark time (e.g., *tempus erat quo Libra pares examinat horas, | non uno plus aequa die, noctique rependit | lux minor hibernae verni solacia damni*, 8.467-70) or to identify location (e.g., *deprensus est hunc esse locum qua circulus alti | solstitii medium signorum percutit orbem*, 9.531-2). In such passages, then, Lucan occasionally makes a show of, and frequently relies, on technical knowledge drawn from a number of scientific disciplines.

At times, however, Lucan finds himself unable to account for certain events or natural phenomena, and critics tend to explain this predicament by again appealing to the poet's rejection of standard epic motifs.⁹ Cut off from traditional sources of inspiration and forced to

⁷ Migliorini 1997: 101-4 and Asso 2010: 179 discuss Lucan's familiarity with the relevant theories. Note that when Caesar finally allows the Pompeians to drink, the volume and intensity of their draughts ironically prevent the air from circulating in their empty veins (*continuus multus subitarum tractus aquarum | aera non passus vacuis discurrere venis | artavit clausitque animam*, 4.368-70). Since the troops have been without moisture, their veins contain only air and little or no blood (*vacuis... venis*) and the sudden influx of liquid now hinders the movement of that air (*aera non passus... discurrere*).

⁸ For astronomy in Lucan, see Beaujeu 1979, who emphasizes Lucan's accuracy and contrasts his practice with those of other epic poets. Cf. Housman 1926: 325-37, Barrenechea 2004, and Raschle 2007. Astrological knowledge acquires a similar status. See, e.g., Hannah 1996, who interprets Nigidius Figulus' speech from an astrological perspective and demonstrates its precision.

⁹ Feeney 1991: 274-85 treats the thematic significance of Lucan's supposed "ignorance" or "uncertainty" and emphasizes that both Lucan and his characters remain consistently perplexed by the realm of the divine. Viansino 1974: 81 + n.7 and Schrijvers 2005: 36-9 associate Lucan's tendency to list multiple explanations for natural phenomena with didacticism, but fail to take context into account or even to distinguish between passages spoken in the narrator's voice and

rely on Nero as his perverse imperial Muse (cf. 1.63-6), the poet affects not to be able to understand the world around him. But this does not mean that Lucan has no confidence in the ability of the scientific disciplines to analyze the natural world. Even when Lucan professes not to understand a natural phenomenon, he does not simply pass over it in silence, and his treatment of the Syrtes provides a good example of the technique that he tends to adopt. When describing the peculiar nature of the Syrtes, the poet offers two possible explanations: either nature herself simply left the Syrtes half-way between sea and land, or the Syrtes used to be completely submerged but the sun has been gradually drawing up water from the ocean and one day the Syrtes will be all land (9.303-18). Although the first possibility seems somewhat arbitrary, the second explanation rests on the well-established scientific theory that the stars draw their nourishment from the exhalations of terrestrial waters. The basic theory has a long history, being attributed to Thales (Aet. 1.3.1 = *Dox. Gr.* 276 Diels) and also to Parmenides and Heraclitus (DK 22 A 11). Despite Aristotle's condemnation (*Meteor.* 354b23 – 355a3), the idea continued to attract followers (e.g., *SVF* 1.504 and 2.652), and Lucan clearly entertains the idea. As with his account of the Delphic oracle, which we encountered in Chapter 3.3, Lucan carefully and methodically explains the nature of the situation and presents the reader with a scientifically viable option for understanding it. Although he withholds judgment, Lucan's exposition is precise and scientifically plausible. The world can and should be described in scientific terms.¹⁰

But even though he possesses a high level of scientific sophistication, Lucan refuses to play the role of the didactic poet—such poetry constitutes a rival genre. Early in the poem, he

those spoken by his characters; cf. Myers 1994: 140 on Ovid's Pythagoras. Wick 2004: 2.113 connects Lucan's interest in multiple causes with declamatory exercises and a love for *amplificatio*.

¹⁰ For more on Lucan's "Syrte digression", see Wick 2004: 2.111-18.

explicitly and programmatically rejects cosmological didactic and sets himself in opposition to those who work in this tradition. This aggressive critique occurs in Book 1, and thereby mirrors or anticipates the extended critiques of didactic that occur in the final two books of the work. At the same time, this critique clearly suggests that civil war itself is responsible for paralyzing and corrupting the tradition of cosmological didactic, and this allows us to understand Lucan's treatment of didactic poetry in general as parallel to his treatment of epic poetry.¹¹ Half way through Book 1, Lucan catalogues the various places and peoples that Caesar's troops leave behind on their march to Rome (1.392-465). This narrative corresponds to the standard epic catalogue of forces. One of the areas Caesar's men leave behind is a stretch of the Gallic coast, which leads Lucan to discuss the nature of the tides. Here, Lucan emphatically distances himself from the didactic tradition:

ventus ab extremo pelagus sic axe volutet
 destituaque ferens, an sidere mota secundo
 Tethyos unda vagae lunaribus aestuet horis,
 flammiger an Titan, ut alentes hauriat undas,
 erigat Oceanum fluctusque ad sidera ducat,
 quaerite, quos agitat mundi labor; at mihi semper
 tu, quaecumque moves tam crebros causa meatus,
 ut superi voluere, late. (1.412-19)

Whether the wind from the furthest clime thus rolls the sea and, while carrying it, abandons it, or the wave of wandering Tethys, set in motion by the lesser star, rises and falls with the lunar hours, or flame-bearing Titan raises Ocean and leads the flood to the stars so that he may drink the nourishing waves—investigate, you whom the toil of the world excites. But you, whatever cause you may be who sets in motion such frequent movements, may you always lie hidden from me, as the gods above have wished.

¹¹ For Lucan's rejection of traditional epic norms, see, e.g., Bramble 1982 and Feeney 1991: 250-301.

This passage constitutes a *recusatio* to the tradition of cosmological didactic.¹² Again, as we saw in Chapter 1.2, Latin didactic frequently deploys a string of indirect questions to announce its subject matter, and the present collection of such indirect questions situates the passage within that tradition. But Latin poets also use this same technique to write a *recusatio* to the tradition of cosmological didactic, and Lucan's style and vocabulary clearly align him with this topos.¹³ Propertius, for instance, decides against writing cosmological didactic since girls are not accustomed "to investigate the workings of the universe, nor why the moon reins in her horse and toils, nor whether we will survive at all beyond the Stygian waves, nor whether lightning is sent forth and thunders by design" (*harum [sc. puellarum] nulla solet rationem quaerere mundi, | nec cur frenatis luna laboret equis, | nec si post Stygias aliquid restabimus undas, | nec si consulto fulmina missa tonent*, 2.34.51-4).¹⁴ Lucan follows this pattern but with a subtle twist. Instead of enumerating a variety of natural phenomena that he will not treat in didactic song, he presents three possible explanations for one particular natural phenomenon and then refuses to single out the correct explanation. This maneuver allows Lucan to demonstrate the depth and precision of his technical knowledge and simultaneously to suggest that those poets who prefer to answer such questions once and for all involve themselves in an unnecessary and pedantic exercise. Moreover, Lucan declares that the gods themselves desire certain natural phenomena to remain unexplained (*ut superi voluere*). This implies that those poets who investigate such

¹² Viansino 1974: 81 implies and Green 1991: 245 n.14 states that the passage is a *recusatio*, although neither goes into any detail. Roche 2009: 287 connects it with didactic poetry.

¹³ Thus Prop. 2.43.51-4, Tib. 2.4.15-20, and Virg. *Geor.* 2.475-94. Cf. Colum. 10.215-29. The key terms that connect Lucan with these passages are *quaerere*, *mundus*, and *causa*.

¹⁴ Note that just before he writes his own *recusatio* to cosmological didactic at the end of the second *Georgic*, Virgil develops a string of such indirect question (2.475-82), enumerating topics that he hopes that the Muses will teach him, including what causes the tides (*qua vi maria alta tumescent | obicibus ruptis rursusque in se ipsa residant*, 2.479-80).

topics act contrary to the will of the gods and that Lucan's refusal to write cosmological didactic therefore comes with divine sanction. Lucan both undermines and outdoes didactic poetry and the didactic poet.

It is also significant that poets of cosmological didactic regularly characterize their subject matter as something hidden that they themselves must uncover or reveal. Ovid's Pythagoras, for instance, teaches "whatever lies hidden" (*quodcumque latet*, *Met.* 15.72) and promises to sing about "things that have lain hidden for a long time" (*quaeque diu latuere, canam*, *Met.* 15.147).¹⁵ Similarly, Manilius can call nature herself "the guardian of first principles that lie hidden" (*principium rerum et custos natura latentum*, 3.47) and declares programmatically that, thanks to his verses, "now nature lies hidden nowhere" (*iam nusquam natura latet*, 4.883). Both Ovid and Manilius stand in the tradition of Lucretius, who regularly speaks of Epicurus or reason itself as banishing darkness and obscurity and shedding light on the true nature of the world.¹⁶ By emphatically ordering the *causa* of the Gallic tides to lie hidden, Lucan appropriates this rhetoric and turns it upside down, thereby configuring himself as the exact opposite of Lucretius, the most conspicuous Latin exemplar of the tradition of cosmological didactic.¹⁷ Since Lucan's Stoicizing world-view contrasts markedly with

¹⁵ For the close associations between Ovid's Pythagoras and didactic, see Chapter 1.2.

¹⁶ See West 1969: 79-93, and note the use of *latere* at *DRN* 3.273-81. Leigh 1999: 175 observes that this kind of rhetoric is common from Plato onwards. Although Roche 2009: 287 asserts that the combination of *causa* and *latere* occurs regularly in verse, citing as influential Virg. *Aen.* 3.32 and 5.5, the natural philosophical context, accumulation of indirect questions and loaded vocabulary in Lucan's text all point to a very specific tradition. Moreover, at *Aen.* 3.32, the hidden *causae* are also natural philosophical.

¹⁷ Green 1991: 245 n.14 says simply that "The epic poet is Lucretius, obviously" and reductively explains the passage by asserting that "The Stoics did not think that causes could be known". In addition to characterizing Lucan as a dogmatic Stoic philosopher, which he is not, this reading grossly oversimplifies Stoic theories of causation and contradicts numerous passages in the

Lucretius' Epicureanism, this rejection does not come as a surprise. At one level, the Lucretian goal of achieving *ataraxia* through philosophical or scientific inquiry appears to backfire. Investigating the *causae* of nature does not simply "excite" or "inspire", but may actually "disturb" or "agitate" the didactic poet (*quos agitat mundi labor*). At another level, it is essential to remember that Lucan's *recusatio* occurs within the broader context of Caesar's march on Rome. As Caesar's troops invade Italy and throw the world itself into turmoil and confusion, the Lucretian pursuit of *ataraxia* becomes a kind of idealistic and irresponsible escapism. Although Lucan's gods, like those of Lucretius, do not take an active role in the affairs of men, they do not support the study of cosmological didactic and implicitly urge the poet to devote his energies to the war that is about to break out. Under such circumstances, no Roman can afford to linger on the outskirts of the known world and to play the part of Lucretius' Epicurus, a wanderer beyond the *moenia mundi*—or, in this case, a wonderer along the Gallic coast—who willfully neglects the concerns of state. In contrast to this kind of figure, Lucan takes sides in the ongoing conflict and regularly represents himself as an active participant in the narrative that he creates. The Lucretian tradition fails to provide the tranquility it promises and ignores more urgent concerns.¹⁸ Lucan will not write this kind of verse.

This constitutes Lucan's verdict on cosmological didactic in general and Lucretian didactic in particular. The concluding section of the catalogue, however, extends this critique and situates it within a larger literary framework. Just before he finally addresses the Roman

poem, some of which are cited above, where Lucan readily explains natural philosophical *causae*. Viansino 1974: 81 suggests that Lucan's direct address to *causa* is didactic in nature and compares Virgil's apostrophe to *medica* at *Geor.* 1.215-6. From this perspective, note that Acoreus repeatedly addresses the Nile in the second person in Book 10.

¹⁸ For Lucan's active participation in and personal commitment to the events he narrates, see, e.g., Marti 1975: 84-90, Viansino 1974: 99, and O'Higgins 1988: 209.

soldiers, Lucan turns his attention to two groups of poets, the Bardi (1.447-9) and the Druids (1.450-8). These two sets of figures correspond to the two major strands of Roman hexameter poetry, martial epic and didactic, respectively, and we will consider them in reverse order.¹⁹ The Druids preside over certain religious rites, know about the gods and the heavens, and sing (*canitis*, 1.457) about the immortality of the soul. From the perspective of Roman literature, they play the role of cosmological didactic poets,²⁰ and their appearance at the end of the catalogue needs to be read against Lucan's own *recusatio* to cosmological didactic.²¹ After assimilating the Druids to the poets of this tradition, Lucan reflects on their achievements:

certe populi quos despicit Arctos
 felices errore suo, quos ille timorum
 maximus haut urget leti metus. inde ruendi
 in ferrum mens prona viris animaeque capaces

¹⁹ Although Lausberg 1990 clearly shows the difficulty in distinguishing epic and didactic from one another according to Greco-Roman perspectives, Lucan assigns the Bardi and the Druids very different functions. Moreover, it is only the Bardi whom Lucan calls *vates* (1.448). As O'Higgins 1988 demonstrates, Lucan applies this term to both himself and other epic figures who parallel his own poetic (= epic) persona.

²⁰ Green 1991: 248, citing *positis... ab armis* ("now that you have put down your weapons", 1.451), misleadingly calls the Druids "warrior-priests". This ignores the significance of *canitis* and the broader context of the passage. In construing Druids as didactic poets, however, Lucan actually elaborates on Caesar *BG* 6.13-4, where Caesar emphasizes the Druids' religious duties, *doctrina*, *disciplina*, and study of poetry. He also mentions their teachings about reincarnation and declares: *multa praeterea de sideribus atque eorum motu, de mundi ac terrarum magnitudine, de rerum natura, de deorum immortalium vi ac potestate disputant et iuventuti tradunt* (6.14.6). Although Feeney 1991: 227 n.118 recognizes that the Druids are poets of cosmological didactic, he does not distinguish between the Bardi and the Druids and so claims that "By making the barbarian bards into epic eulogists, Lucan appears to be 'correcting' Caesar, who had described the Druids as composers of learned, scientific, cosmological poetry".

²¹ The structure of the entire catalogue reinforces the contrast between Lucan's *recusatio* and the Druids. The catalogue itself follows an ABBA structure: A) 392-5, about the Romans; B) 396-419, places the Roman troops leave behind; B) 419-62, peoples the Roman troops leave behind; A) 463-5, about the Romans. Both A sections take up roughly the same number of lines, while the second B section is roughly twice as long as the first. More importantly, the first B section ends with Lucan's *recusatio* to cosmological didactic and the second ends with Lucan's portrait of the Druids from the perspective of cosmological didactic.

mortis, et ignavum rediturae parcere vitae. (1.458-62).

To be sure, the people on whom Arctos looks down are happy in their error, [for] the greatest of terrors does not harass them, namely, the fear of death. That is why their men have minds that are ready to rush upon the sword and spirits that tolerate death, and [they consider it] cowardly to spare a life that will return.

Although the Druids are mistaken in their beliefs about reincarnation (*errore suo*), their didactic songs free the Gauls from the fear of death and encourage them to fight more bravely. Two points need to be made. On the one hand, the Druids are fully committed to their own society. By teaching about the immortality of the soul, they inspire their warriors and so contribute to their country's defense. Whereas the Lucretian poet wanders aimlessly on the fringes of the universe and withdraws from public life, the Druids remain active and engaged. On the other hand, although freedom from the fear of death plays a central role in Stoic ethics, it also constitutes a major element of the Lucretian *ataraxia* that Lucan's *recusatio* suggests is illusory and cannot be achieved.²² This is a point that Lucan makes elsewhere in more explicit terms. At the end of the second *Georgic*, Virgil programmatically praises Lucretius, blessing him for his natural philosophical learning and for having banished the fear of death (*felix qui potuit rerum cognoscere causas | atque metus omnis et inexorabile fatum | subiecit pedibus strepitumque Acherontis avari*, 2.490-2). Lucan adapts these lines to make a very different point when he contrasts the fortunes of Caesar's and Afranius' troops at Ilerda (4.382-401).²³ After Afranius'

²² Roche 2009: 298 rightly notes that both Stoics and Epicureans pursue this goal. Green 1991: 248 + n.16 misses this point of commonality and attempts to assimilate the Druids to "Stoic philosophers" who both know and practice "what is virtually Stoic orthodoxy". Although it is tempting to connect *inde ruendi | in ferrum mens prona viris* with Stoic ideas about suicide, Lucan is extremely vague about what the Druids actually believe, and it is far from clear that either their philosophy or their behavior corresponds to any kind of Stoic dogma. Elsewhere, Green notes that Lucretius traces the origins of civil war to the avarice that results from the fear of death (*DRN* 3.68-72) and then confusedly attempts to connect this Lucretian theory with Lucan's Gauls (1991: 245 n.14).

men surrender, the poet laments the miserable lot of those who must continue to fight and deems happy those who have been released from their military service: “blessed was he who was already able to know where he was to lie when the collapse of the world was tottering” (*felix qui potuit mundi nutante ruina | quo iaceat iam scire loco*, 4.393-4). Lucan completely inverts Virgil’s *makarismos*—he substitutes for the poet of cosmological didactic those real world combatants who have escaped the business of civil war, and replaces the intellectual mastery over the fear of death with the simple knowledge of one’s final resting place. These changes suggest that the didactic poet is not so *felix* and cannot easily assuage his readers’ fears.²⁴ Knowledge of the causes of things (Virgil’s *rerum cognoscere causas*) appears inconsequential and ultimately pointless at a time when the things themselves are coming apart at the seams (Lucan’s *mundi nutante ruina*). Lucan’s Druids, however, operate outside the ravages of civil war and so beat Lucretius at his own game. That they sing about the soul’s immortality, a belief against which Lucretius repeatedly argues and inveighs, dramatically underscores this idea. Philosophically speaking, the Druids are the exact opposite of Lucretius. From this perspective, then, the Druids represent an alternative or foreign tradition of cosmological didactic, one that succeeds where the Greco-Roman tradition falters, and Lucan emphasizes their otherness by drawing attention to their “foreign rites and perverse custom of sacrifices” (*barbaricos ritus moremque sinistrum | sacrorum*, 1.450-1). Ironically, the “barbaric” poets do what Greeks and Romans like Lucretius cannot.

²³ Lucan’s use of the phrase is noted in passing by Viansino 1974: 79-80 n.4 and discussed briefly by Salemme 2002: 17 and Asso 2010: 187, who observes that the Virgilian context also relates to civil war. Braund 1992: 260 also suggests a parallel between *o fortunati* at 4.319 echoes Virg. *Geor.* 2.458, *o fortunatos*.

²⁴ That the Gauls are *felices errore suo* (1.459) may recall Virgil’s *makarismos* as well.

But even though he explicitly rejects the philosophical positions of Lucretius and the Druids, Lucan does not suggest that cosmological poetry itself is inherently flawed or deficient.²⁵ The problem lies in the corrupting effects of civil war. Lucan's characterization of the Bardi reinforces this point.²⁶ Addressing the Bardi, Lucan declares: "you too, who, as poet-priests, send forth through your praises into long eternity brave souls that were taken away by war, have poured out many poems in peace" (*vos quoque, qui fortes animas belloque peremptas | laudibus in longum vates dimittitis aevum, | plurima securi fudistis carmina*, 1.447-9). The Bardi perform the role of the Homeric rhapsode or Virgilian *vates* who praises the famous deeds of heroes and so guarantees them immortality. This is precisely what Lucan refuses to do in his own poem. In the present passage, for instance, instead of praising the Roman troops in the fashion of a standard Homeric catalogue, Lucan conspicuously refrains from mentioning them and glorifying their behavior—the perverse nature of civil war is incommensurate with the norms of Homeric and Virgilian epic.²⁷ Like the Druids, the foreign Bardi flawlessly perform a task that proves virtually impossible for the Roman Lucan. This constitutes an important paradigm to which Lucan returns when he launches his extended critiques of didactic poetry in Books 9 and 10. The Psylli, in Book 9, and Acoreus, in Book 10, do not belong to the Greco-Roman world and so

²⁵ Nor does Lucan's rejection of Lucretian didactic at the generic level mean that Lucan does not borrow phrases and ideas or allude to entire passages from the *DRN*. Moretti 1985: 135-41 and Leigh 1999: 174-7 discuss a number of passages wherein Lucan draws on Lucretius. Cf. the discussion of the Libyan *fons* in section 2 below.

²⁶ My reading of the Bardi and the way in which their behavior contrasts with Lucan's self-presentation follows Green 1991: 247 and Feeney 1991: 277, who calls the present passage "a wicked parody of Vergilian language".

²⁷ See Green 1991: 243-51 on the present passage, and cf. Feeney 1991: 274-7. Only after Pharsalus, when the *civil* war has effectively ended, does Lucan present himself in a way that parallels the Bardi, and it is significant this happens at the site of Troy (9.980-6).

stand outside its literary traditions. For this very reason, they too can put didactic poetry to use when the familiar didactic poets of Greece and Rome fail hopelessly.²⁸

The disruptive and corrosive influence of civil war also provides a framework for understanding Lucan's treatment of the Aratean tradition. As in the case of the *recusatio*, Lucan does not call into question the accuracy of the information that the Aratean tradition transmits. We have already seen that the poet assigns particular value to astronomical knowledge, and this value judgment influences his representation of Aratus and the Latin *Aratea*. The encounter between Caesar and Amyclas in Book 5 and the exchange between Pompey and his anonymous helmsman in Book 8 make this explicit. I propose that the former scene aligns itself with the second half and the latter with the first half of Aratus' *Phaenomena*, and together they reveal Lucan's judgment on the Aratean tradition and on the practical application of astronomical knowledge. Both scenes show characters within the historical narrative of the poem attempting to put scientific learning to good use, but ultimately failing to persuade those in power to listen. These two scenes suggest the conspicuous irrelevance of both scientific learning itself and didactic poetry. The poem's two main protagonists are either uninterested in or simply indifferent to the astronomical learning that could help them, and even though their interlocutors are deeply familiar with the Aratean tradition of scientific poetry, that poetry fails to find an audience. This kind of learning and this kind of poetry no longer have significant roles to play in a world overwhelmed by civil war, and it seems unlikely that they will ever be able to provide practical benefits of any kind.²⁹

²⁸ Erichtho is another example of a foreign and therefore efficacious epic poet or *vates* who parallels the Bardi. See the discussions of O'Higgins 1988 and Masters 1992.

²⁹ See Lausberg 1990: 184 + n.52 for a succinct comparison of these two passages.

After transporting his army to Epirus and encamping at Dyrrachium, Caesar slips away in the middle of the night to search for a way back to Italy. He stumbles upon a small boat belonging to a certain Amyclas and immediately demands that Amyclas convey him to Hesperia. In contrast to Caesar's larger-than-life epic dimensions, Amyclas appears lowly and humble, the very embodiment of the Alexandrian and particularly Aratean slender style—his hut consists of reeds, his bed consists of seaweed, and he himself knows nothing of war (5.515-31).³⁰ In response to Caesar's command, "poor Amyclas" (*pauper Amyclas*, 5.539) lists the particular sun signs, moon signs, and sub-celestial portents that indicate inclement weather and hence make him reluctant to sail (5.540-56). Amyclas' speech belongs to the Aratean tradition. In the second half of the *Phaenomena*, Aratus discusses the various celestial and sub-celestial signs that allow the reader to predict the weather. Aratus' Latin imitators treat the topic as well, and Amyclas' list of sub-celestial portents, in particular, corresponds closely to Virgil's analysis of signs of bad weather:³¹

sed mihi nec motus nemorum nec litoris ictus
nec placet incertus qui provocat aequora delphin,
aut siccum quod mergus amat, quodque ausa volare
ardea sublimis pinnae confisa natanti,
quodque caput spargens undis, velut occupet imbrem,
instabili gesso metitur litora cornix. (5.551-6)

³⁰ At *Phaen.* 783-7, Aratus famously embeds the acrostic ΛΕΙΠΘΗ in his poem. Narducci 2002: 252 connects the characterizations of Amyclas and Caesar with the *otium* and *negotium* of the farmers and political figures, respectively, in Virgil's *Georgics*.

³¹ Aratus treats celestial (moon, sun, other stars) and then sub-celestial signs, discussing various kinds of weather at every stage. Virgil reverses this order and streamlines the contents, discussing sub-celestial signs, first for bad weather and then for good weather, before treating the celestial (moon, sun). Amyclas reverts to Aratus' basic arrangement, discussing celestial (sun, moon) and then the sub-celestial signs, but deals only with bad weather. Pichon 1912: 228, Morford 1967a: 38-9, Thompson and Bruère 1968: 10-16, Barratt 1979: 177-84, Paterni 1993, and Esposito 2007 discuss various reminiscences and parallel passages. Morford 1967a: 26-8 notes the importance of the didactic and scientific traditions for the literary storm topos more generally.

But neither the commotion of the woods nor the dashing against the shore pleases me, nor the uncertain dolphin that stirs the sea, or the fact that the gull loves dry land, and that the heron dares to fly on high and relies on its swimming wing, and that the crow sprinkles its head in the waves and, as if to anticipate rain, traverses the shore with hesitant step.

Aratus begins his discussion of the weather by listing four signs that indicate wind: a swelling sea, resounding beaches, shores reverberating in good weather, and noise on mountain peaks (*Phaen.* 909-12). Although he too begins his treatment of bad weather with a set of four signs, Virgil splits them into two groups and adds a new element at the end: indications of strong winds include either swelling seas and noise on the mountains (*Geor.* 1.356-8) or resounding shores and noise in the woods (*aut resonantia longe | litora misceri et nemorum increbrescere murmur*, *Geor.* 1.358-9). Unlike his predecessors, Amyclas starts with only two signs. But these two signs correspond to and reverse the order of Virgil's second grouping—Amyclas has clearly read the *Georgics*.³² Amyclas, however, is no poet. Rather, I suggest that he represents the ideal reader of didactic poetry, one who knows the didactic tradition by heart and attempts to utilize that tradition in the “real world”. Aratus, for instance, exhorts the reader at length to learn the weather signs carefully and stresses the practical nature of such knowledge for those who spend time at sea: “Let it be a concern to you, if you ever trust in a ship, to discover however many signs are established anywhere for stormy winds or a hurricane on the sea. The toil is little but straight away countless benefits arise from being observant to the man who is always on

³² Cf. Esposito 2007: 101 + n.46. Thompson and Bruère 1968: 13 say simply 5.551 is “a curtailed version” of *Geor.* 1.356-9, and similarly note that the signs in 5.553-6 have been “culled” from *Geor.* 1.361-4 and 383-9. It is worth noting, however, that Amyclas lists the same birds in the same order: Virgil mentions gulls heading for shore (1.361-2), high-flying herons (1.363-4), and crows walking on the beach (1.388-9). Paterni 1993: 61-2 + n.3 compares 5.541-3 with Aratus *Phaen.* 829-30, a passage that does not appear in Virgil, and concludes that Lucan—or, from our perspective, Amyclas—must have consulted Aratus directly or an actual Latin *Aratea*. Esposito 2007 points to several passages that suggest a familiarity with the texts of both Aratus and Cicero's *Aratea*.

guard...” (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’ ὄνειρα | γίνετ’
 ἐπιφροσύνης αἰεὶ πεφυλαγμένῳ ἀνδρὶ, *Phaen.* 758-62). Whatever we as modern readers make of
 such language, figures such as Aratus and Amyclas take the point seriously.³³ From this
 perspective, it is essential to note that Amyclas correctly reads the weather signs—when he
 finally yields to Caesar’s orders, the weather immediately turns bad, the winds begin to disturb
 the sea, and a cataclysmic storm soon engulfs the ship, cutting the voyage short. Caesar, by way
 of contrast, has read neither Aratus nor Virgil and shows no interest in the potential benefits that
 scientific learning has to offer. Simply put, Caesar thinks that he has nothing to learn from this
 tradition, and he does not hesitate to spurn Amyclas’ advice (*sperne minas inquit pelagi
 ventoque furenti | trade sinum...*, 5.578-9). Didactic poetry appears completely irrelevant to the
 general and fails entirely in its attempt to aid and protect those who live in the “real world”. As
 the universe itself teeters on the brink of absolute collapse and Caesar’s own actions precipitate
 the breakdown of the cosmos, the Alexandrian refinement and scientific sophistication of Aratus
 and Virgil are easily dismissed. Although Amyclas vindicates the Aratean knowledge
 transmitted by the Aratean tradition, demonstrating its accuracy and possible utility, this
 vindication means nothing within the historical narrative of the poem. Scientific learning cannot
 be put to practical use.

The encounter between Pompey and his anonymous helmsman provides an important
 parallel to this scene. In the immediate wake of Pharsalus, Pompey is directionless, “confusing
 the uncertain traces of flight and paths twisted with wandering” (*incerta fugae vestigia turbat |*

³³ The claim to practical utility is typical of ancient didactic. See Chapter 1.2.

implicitasque errore vias, 8.4-5). After he is reunited with Cornelia, Pompey again sets sail and consults his helmsman about the paths of the stars:

rectoremque ratis de cunctis consulit astris,
unde notet terras, quae sit mensura secandi
aequoris in caelo, Syriam quo sidere servet
aut quotus in Plaustro Libyam bene derigat ignis. (8.167-70)

He asks the helmsman of the ship about all the stars, whence he distinguishes the lands, what is the measure in the sky for cutting the sea, by what star does he keep course for Syria or how small a fire in the Plow guides him well to Libya.

Again, this string of indirect questions immediately situates the scene within the tradition of Latin didactic.³⁴ The topic, however, associates this passage with the first half of Aratus' *Phaenomena*, where Aratus describes the geography of the heavens, and it comes as no surprise that the helmsman is "learned" in such things (*doctus ad haec*, 8.171). The epithet *doctus* distinguishes this anonymous figure from other epic helmsmen and carefully points to the *doctrina* typical of the Aratean tradition. Moreover, like Aratus and his Latin imitators, the helmsman actually begins by describing the pole and the circumpolar constellations (*signifero quaecumque fluunt labentia caelo, | numquam stante polo miseros fallentia nautas, | sidera non sequimur, sed, qui non mergitur undis | axis inocciduus gemina clarissimus Arcto, | ille regit puppes*, 8.172-6).³⁵ These lines further associate the helmsman with Aratus, casting the speech itself as a kind of miniature *Aratea*, and emphasize the fixity and reliability of the astronomical knowledge upon which the helmsman relies. The remainder of the speech confirms this impression. Here, the helmsman methodically teaches Pompey about the changing positions of the heavenly bodies that allow him to sail for the Bosphorus and Pontus and then to head for

³⁴ Note that Pompey's four questions parallel the four questions that open the *Georgics* and that the metrical position of *quo sidere* (8.169) may echo the first line of Virgil's poem (*quid faciat laetas segetes, quo sidere terram | vertere...*).

³⁵ Cf. Aratus *Phaen.* 19-44, Cic. *Aratea* fr. 3-7, and Germanicus 17-47.

Syria, Pharos, and eventually the Libyan Syrtes (8.176-84). The helmsman, then, answers the questions put to him precisely and succinctly, and, at the same time, fulfills the fundamental task of the Aratean poet. As with the weather signs, Aratus programmatically insists that Zeus has put the constellations in the sky for the benefit of those on earth (ὁ δ' ἥπιος ἀνθρώποισι | δεξιὰ σημαίνει..., *Phaen.* 5-6). By describing and explaining these signs, the Aratean poet renders them useful for those around him. Like Amyclas, the helmsman attempts to do just this, namely, to guide a wandering and uncertain Pompey to safety. In one important respect, however, Pompey differs from Caesar. By actively seeking out the advice of the Aratean tradition, he suggests that science and poetry may still be able to function in a time of civil war. But when the helmsman actually asks where his passenger wants to go, Pompey remains doubtful (*dubio... pectore*, 8.186) and finds himself unable or unwilling to take advantage of the benefits that the helmsman has to offer: “mark this alone across the whole sea, that your ship be always further from Emathian shores and that you leave Hesperia behind by sea and sky: give [all] other things to the winds... fortune will provide a port” (*hoc solum toto... in aequore serva, | ut sit ab Emathiis semper tua longius oris | puppis et Hesperiam pelago caeloque relinquo: | cetera da ventis... portum fortuna dabit*, 8.187-90, 192). Despite his initial request for a didactic lesson, Pompey does not listen to what the didactic tradition says. Instead, the general paradoxically forces Aratean *doctrina* and Hellenistic astronomy into the service of randomness and centrifugal flight, preferring to rely on *fortuna* rather than Alexandrian erudition.³⁶ That Pompey eventually sails to his death subtly underscores the extent to which the didactic tradition fails to fulfill its promise.³⁷

³⁶ Contrast the rather different tone of Palinurus at *Aen.* 5.22-3: *superat quoniam Fortuna, sequamur, | quoque vocat vertamus iter.*

Caesar's disdain for and Pompey's indifference to the Aratean tradition are symptomatic of the general collapse of values that accompany civil war. This literary tradition transmits useful scientific knowledge that ought to be heeded. Although Caesar's encounter with Amyclas and Pompey's interview with his helmsman further confirm the reliability of and the privileged status accorded to astronomical knowledge in Lucan's poem, both episodes clearly demonstrate the impossibility of putting that knowledge to good use. Lucan may embrace the results of scientific inquiry and analyze the natural world from a scientific perspective, but he programmatically refuses to write a didactic poem and dramatically sets himself in opposition to those *quos agitat mundi labor*. Figures who possess scientific knowledge and show close affinities with the traditions of Aratean poetry are fundamentally unable to engage their audiences and employ their erudition. After Pompey's ultimate demise, the situation only intensifies. As the poem's surviving protagonists, following in Pompey's wake, leave the familiar landscapes of Greece and Rome behind them and begin to explore the edges of the universe, the value and function of didactic poetry become increasingly problematic. Didacticism no longer offers any assistance at all to those suffering the throes of civil war and, on occasion, it even attempts to destroy them.

2. Cato and the Libyan Snakes

³⁷ The helmsman's trustworthiness and accuracy contrast markedly with Pompey's ignorance and aimlessness, and Lausberg 1990: 184 well compares *Aen.* 10.160-2, where Pallas asks Aeneas about the stars. Note that Pompey has previously bemoaned the glory of his youth, including his successful naval exploits (*Corycias classes... meminisse piget*, 8.26-7). In the distant past, Pompey possessed unrivaled naval experience and power but now seems a hollow shell of his former self, unable even to find his way at sea by means of the heavenly bodies.

In Book 9 of the *Bellum Civile*, Cato arrives in North Africa, where he and his men undertake a brutal march across the Libyan desert and subsequently arrive at a spring that swarms with poisonous snakes. At this point, Lucan launches into a lengthy digression in which he hesitantly accounts for the presence of the snakes with a mythological aition (9.619-99) and then catalogues the names and most salient attributes of 17 serpents in 34 lines (9.700-33). When the historical narrative resumes, Cato's troops fall victim to the snakes one after another in a comically grotesque and learned massacre before the Psylli, a North African tribe immune to snake venom and equipped with magical incantations, come to the rescue and miraculously save the Republican army (9.734-937). Cato's seemingly mythic ordeal shows certain parallels with a variety of literary and historical adventures, and scholars have argued that Lucan models his "hero" on such diverse figures as Hercules, Jason, Perseus, Aeneas, Alexander, Ophellias, Regulus, and Marius.³⁸ Whatever texts and whatever paradigms may be at play, however, several critics have recently attempted to read the episode on the basic assumption that not only language, but the history and nature of poetry itself constitute core thematic concerns of the *Bellum Civile*.³⁹ Although such analyses make a number of useful observations, they fail to take adequate account of the importance of the didactic tradition to the episode as a whole and to read

³⁸ Scholarly analysis of the expedition as a whole has tended to focus on either Lucan's sources or his characterization of Cato and Cato's Stoicism. For useful summaries of scholarship on the expedition, see Ahl 1976: 252-79, Bartsch 1997: 29-35, and D'Alessandro Behr 2007: 113-6. Raschle 2001 and Wick 2004 provide more detailed introductions, and Leigh 2000 situates Cato's trek within a broader understanding of ancient ideas about Libya. Although I am not concerned with Lucan's attitude towards Cato as such, I sympathize with those who find his presentation at the very least problematic. For our purposes, however, it will be necessary simply to recognize—along with scholars such as Johnson 1987: 35-66, Bartsch 1997: 29-30, and Leigh 2000: 108-9—the humor and irony implicit in the sheer excesses and improbabilities of the Stoic sage's battle with an army of poisonous snakes.

³⁹ Eldred 2000, Malamud 2003, Papaioannou 2005, and D'Alessandro Behr 2007. These studies, as well as the present analysis, are fundamentally indebted to Henderson 1988 and Masters 1992, who compellingly demonstrate Lucan's pervasive interest in language and poetry.

it against Lucan's treatment of scientific knowledge and didactic poetry elsewhere in the poem. It is well known that this passage draws on Nicander's *Theriaca* (and most likely Aemilius Macer's Latin adaptation), which describes a variety of poisonous animals, especially snakes, from an essentially natural historical perspective and simultaneously transmits medical remedies for those who have suffered their bites. It is my thesis, however, that Lucan in fact adopts the generic voice of the didactic poet and that the entire episode itself exhibits a far more pervasive didactic presence than has been hitherto realized. I suggest that through this maneuver Lucan intensifies the critique of the didactic tradition examined above in section 1 and again reveals the total impossibility of deriving practical benefits from scientific learning.

We have already seen that Lucan dramatizes the irrelevance and inefficacy of didactic poetry through Amyclas and Pompey's anonymous helmsman. Both of these figures, however, operate within the familiar confines of the Greco-Roman world, and both are masters of the reliable and potentially beneficial tradition of astronomical poetry. But as Lucan's narrative leaves behind the comfort of Greece and Rome and rushes precipitously towards the unfamiliar and the uncertain, didactic poetry and scientific knowledge face a new set of challenges. Libya itself constitutes a liminal space completely unlike the rest of the known world.⁴⁰ After falling victim to the snakes, the soldiers lament that nature herself had taken great pains to separate this area from the races of men (*tot monstra ferentem | gentibus ablatum dederas serpentibus orbem, | inpatiensque solum Cereris... damnasti atque homines voluisti desse venenis*, 9.855-8),

⁴⁰ See Thomas 1982: 108-23 for the emphatic otherness of Lucan's Libya. At 9.528-32, 538-43, 533-7, Lucan describes the peculiar appearance of the stars above Libya (cf. 9.495-7), treating Libya as if it were situated at the equator and thereby enhancing its liminality; see Raschle 2007: 66-9. Elsewhere in the poem, Libya is consistently connected with far away places and conceived of as a peripheral environment (e.g. 1.367-72, 3.290-7, 6.60-3 and 306-11, 9.351-2).

suggesting that they themselves have crossed a forbidden boundary.⁴¹ And yet, Libya's otherness assumes an additional significance. At the end of Book 7, after Pompey's defeat at Pharsalus, the universe seems ready to sink into the fiery chaos of ἐκπύρωσις.⁴² When Cato and his forces eventually wash up on the North African shore, we find that this fiery chaos has been realized in the form of the Libyan desert. Libya itself lacks a solid framework and has no mass (*concuteret terras orbemque a sede moveret, | si solida Libye conpage et pondere duro | clauderet exesis Austrum scopulosa cavernis*, 9.466-8), and the soldiers cannot stand still because the sands move beneath their feet (*nullisque potest consistere miles | instabilis, raptis etiam quas calcat, harenis*, 9.464-5). Elsewhere in the poem, the breakdown of the world's *conpages* signals the moment when the cosmic conflagration returns the universe to a state of temporary chaos.⁴³ From this perspective, the Libyan desert, with its oppressive heat and inherent instability, represents a miniature state of perpetual chaos.⁴⁴ After the troops endure an excruciating months-long trek through this unforgiving wilderness, they reach a point where the

⁴¹ Fantham 1992: 108-9 and Bartsch 1997: 29-35 emphasize the importance of boundary violation as a theme of Cato's march. Cf. Cazzaniga 1957: 28-9 + nn.2-3 and Moretti 1999: 247-9. The presence of the didactic plague topos, discussed at length below, reinforces this theme. The plague topos describes a foreign disease, often originating in Africa (e.g. Thuc. 2.48.1-2 and Lucr. 9.859), that descends on an unsuspecting population. In a significant reversal of the topos, Cato and his men actively travel to Africa and are responsible for bringing themselves face to face with *pestis*. If the Athenian plague contrasts radically with the *hybris* of Pericles' funeral oration and foreshadows the eventual destruction of the Athens forces, Lucan's plague may offset the optimism of Cato's Stoic rhetoric and presage the imminent destruction of the Roman *res publica*.

⁴² Lapidge 1979: 370 on 7.809-15.

⁴³ See, in particular, Lapidge 1979: 360-2 on 1.72-80, who notes that Roman writers working in the Stoic tradition use *conpages* "to denote the structure of the universe" which dissolves at the time of ἐκπύρωσις (p. 360). Cf. Schotes 1969: 18-21, and note Hahn 1977: 193 on Stoic διακόσμησις.

⁴⁴ Cf. the description of the Syrtes (9.303-18).

sands start to harden, the continent becomes dense and trees appear (*iamque illi* [sc. *Catoni*] *magis atque magis durescere pulvis* | *coepit et in terram Libye spissata redire* | *iamque procul rarae nemorum se tollere frondes*, 9.942-4). This situation parallels the end of Ovid's flood, another universal cataclysm that returns the earth to a state of flux,⁴⁵ and so confirms the impression that Cato's march constitutes a journey through the randomness of cosmic dissolution. It is precisely the unpredictability and formlessness of this primordial chaos, itself the ultimate byproduct of civil war, that exacerbate and magnify the shortcomings and failures of didactic poetry and scientific theory.

Scholars have long recognized the importance of the didactic tradition for Lucan's snake catalogue and snake battle (lines 700-33 and 734-838, respectively).⁴⁶ A much discussed note in the Bern scholia asserts that Lucan took the names of his snakes from Aemilius Macer's first century BC translation (or adaptation) of Nicander's *Theriaca*.⁴⁷ Although such statements are notoriously suspect, a chance quotation preserved by Isidore (*Orig.* 12.4.24) lends some support to the scholion and suggests that Lucan may have borrowed more than just names from Macer's poem. In a particularly curious departure from his own model, Macer declares that the chelydrus

⁴⁵ Thus *Met.* 1.345-7: *surgit humus, crescunt iuga descrescentibus undis; | postque diem longam nudata cacumina silvae | ostendunt limumque tenent in fronde relictum.*

⁴⁶ The basic studies are Morel 1928, Cazzaniga 1957, and Lausberg 1990. Raschle 2001: 60-8 provides a useful overview and further bibliography. Batinski 1991, however, emphasizes the omnipresence of traditional epic motifs and formulae throughout the scene, arguing that this bizarre confrontation between man and snake is reminiscent of "the mock epic world of Ovid" (p. 78), and Landolfi 2007 stresses the presence of a variety of literary snakes and snake motifs in the actual catalogue. Cf. Johnson 1987: 52-3.

⁴⁷ *Comm. Bern.* ad 9.701: *serpentum nomina aut a Macro sumpsit de libris Theriaca—nam duos edidit—aut quaesita a Marsis posuit.* Quint. 10.1.56 tells us that Macer followed Nicander (*quid? Nicandrum frustra secuti Macer atque Vergilius?*). Hollis 2007: 107-14 gives further parallels between Nicander and Macer. As for the possibility that Lucan may have consulted the Marsi, Leigh 2000: 104 n.75 dubs the idea "less fatuous than it may seem", noting that Galen claims to have done just this (13.315-7 Kühn).

causes the ground to smoke as it glides along (*seu tractus fumat qua taeter labitur anguis*, fr. 8.2 Courtney = 57.2 Hollis).⁴⁸ Lucan clearly echoes Macer when he declares that chelydri are “dragged along as the path smokes” (*tractique via fumante chelydri*, 9.711). Given the meager remains of Macer’s poem, it is impossible to gauge the extent of his influence on Lucan or to assess precisely how Lucan may have altered his work. At the same time, however, it seems likely that Lucan draws on Nicander directly.⁴⁹ For instance, when Lucan describes cerastae as “wandering with twisting spine” (*spinaque vagi torquente cerastae*, 9.716), he appears to follow Nicander *Ther.* 267, where the same snake “roams about on a crooked path with rough back” (οἴμιον ὄδοιπλανέων σκολιὴν τετρηχότι νότω).⁵⁰ In addition to this sort of close borrowing, Lucan also engages in a more general process of *imitatio* or *aemulatio* with Nicander. Consider Nicander’s account of the impression that the basiliscus makes on other snakes:

οὐκ ἄρα δὴ κείνου σπειραχθέα κνώδαλα γαίης
 ἰγγὴν μίμουσιν ὅτ’ ἐς νομὸν ἠὲ καὶ ὕλην
 ἠὲ καὶ ἀρδηθμοῖο μεσημβρινὸν αἰζαντες
 μείρονται, φύζη δὲ παλιντροπέες φορέονται. (*Ther.* 399-402)

⁴⁸ The first line of the fragment corresponds to *Ther.* 421, and Courtney 1993: 296 suggests that the peculiar detail stems from Macer’s “misunderstanding” of the epithet αἰθαλόεις at *Ther.* 420. Note that *tractus* is Nisbet’s emendation, printed by Hollis, for *terra*.

⁴⁹ In any given passage Macer may have served as an intermediary between Nicander and Lucan, and Morel 1928: 346 goes so far as to declare that wherever Lucan and Nicander can be compared, “ist Vermittlung durch Macer anzunehmen”. Much of Lucan’s technical material has no known source and it would be rash to assign most, let alone all, of it to Macer. Raschle 2001: 65-6, Wick 2004: 2.282-3, Hollis 2007: 107-109, and Landolfi 2007 are more cautious. Although he constantly refers to the “tradizione nicandrea” and occasionally suggests that Lucan consulted a paraphrase of Nicander rather than the actual Greek text, Cazzaniga 1957 adduces numerous passages where close verbal borrowings make it clear that Lucan read Nicander directly (see, e.g., 36-7, and cf. Wick 2004: 2.337). Note that both Morel 1928: 347 and Hollis 2007: 108-9 point to certain metrical and stylistic anomalies that may also reflect Macer’s influence on Lucan (e.g., an unusual cluster of spondaic line endings, but cf. Cazzaniga 1957: 37, who observes Nicander’s own spondaic line endings).

⁵⁰ Hollis 2007: 109 compares the two lines. Cf. Cazzaniga 1957: 36.

Indeed the heavy-coiled monsters of the earth do not await its hiss when they dart forth at noon to the fields or woods and are eager for watering, but in headlong flight they turn and are carried back.

Lucan has this passage in mind when he describes the same snake: “pouring forth hissings that terrify all the plagues, causing harm before its poison, the basiliscus moves the whole crowd far from itself and rules in the empty sand” (*sibilaque effundens cunctas terrentia pestes, | ante venena nocens, late sibi summovit omne | volgus et in vacua regnat basiliscus harena*, 9.724-6). Although Lucan’s *pestes* corresponds to Nicander’s *σπειραχθέα κνώδαλα* and both poets create a vivid contrast between the basiliscus and all other snakes, the two passages nevertheless differ radically in perspective. Nicander highlights the plight of those snakes that cannot stand up to the basiliscus, depicting the disruption of their daily lives and their hurried flight at the approach of the “king”. Lucan, however, adopts the point of view of the actual basiliscus that sees itself not as a mere *basileus*, but as an all-powerful *turannos*, one that delights in its ability to terrify the common crowd. This is the type of snake that will ruthlessly cut down Cato’s men in the armed conflict to follow—it is the Caesar of the snake world.⁵¹

Such passages suggest that Lucan did not consult Nicander simply for natural historical details, and Lausberg has even suggested that the entirety of Lucan’s narrative follows the basic outline of his predecessors’ *Theriaca*.⁵² While this may be overstating the case, verbal and

⁵¹ Fantham 1992: 108-9 associates the basiliscus here with the Medusa myth, Leigh 1997: 278 compares it to a gladiator or “king of the ring”, and Eldred 2000: 70-4 connects its later appearance with both Caesar and the epic tradition. Cf. Landolfi 2007: 139-41 on the literary tradition behind *sibila... effundens*.

⁵² “Im weiteren Verlauf der Schlangenepisode ist sozusagen der Gesamtaufbau bei Nikander und Macer in epische Handlung umgesetzt: auf die aufzählende Vorstellung der Schlangen folgt eine Darstellung, wie deren Biß wirkt, aber nicht allgemein theoretisch, wie im Lehrgedicht, sondern in Form einer ebenfalls katalogartig angelegten Serie von sieben Todesszenen namentlich genannter Soldaten. Dann folgt die Rettung durch die Heilmittel—im Epos geschieht sie durch eingreifende handelnde Personen, die Psylli” (Lausberg 1990: 189).

structural echoes of the *Theriaca* tradition do create a conspicuous link between the episode itself and an identifiable branch of ancient scientific poetry. But rather than think of Nicander and Macer—or anyone else, for that matter—as mere source texts, I suggest that these echoes constitute one part of a larger strategy that repeatedly encourages the reader to think about the very nature of the didactic enterprise.⁵³ In order to see this more clearly, we need to consider the ways in which Lucan associates his text with the history of didacticism, subtly casting himself as the didactic poet and the reader as his didactic addressee.

The opening lines of the aitiological digression provide an instructive point of departure:

cur Libycus tantis exundet pestibus aer
 fertilis in mortes, aut quid secreta nocenti
 miscuerit natura solo, non cura laborque
 noster scire valet, nisi quod volgata per orbem
 fabula pro vera decepit saecula causa. (9.619-23)

Why the Libyan climate, fertile for death, overflows with such plagues, or what hidden nature has mixed with the harmful ground, our care and hard work are not strong enough to know, except in so far as a story that has spread throughout the world has deceived generations in place of the true cause.

Three points need to be addressed. First, the *fabula* that Lucan denounces as deceptive and false occupies the next 76 lines of the poem.⁵⁴ The snakes originated, we are told, from drops of blood that fell from the severed stump of Medusa's neck—after he decapitated the Gorgon,

⁵³ Cazzaniga 1957 represents a more traditional view. Although he well highlights the various ways in which Lucan manipulates Nicander's text, he does not conceive of the operation as a literary one: "per Lucano Nicandro non è più ormai un poeta la cui arte qualcosa possa suggerirgli, ma è diminuito ad un semplice trattato: il contenuto gli interessa semmai, non la forma e lo stile" (pp. 32-3).

⁵⁴ D'Alessandro Behr 2007: 125 suggests that *fabula* here explicitly invites the reader "to view Cato's march... as metaphor". Leigh 1997: 265-73 points to other clues that supposedly encourage the reader to treat the episode allegorically, and both Eldred 2000 and Papaioannou 2005 essentially read the snakes themselves as allegories for the power of speech and/or poetry. I side with Malamud 2003: 39, however, who notes the multiplicity of myths and texts informing Lucan's narrative and rightly warns against the temptation to reduce Cato's ordeal to the level of a simple or straightforward (Stoic) allegory.

Perseus flew over the Libyan desert on his homeward journey, and the blood that dripped from his spoils mixed with desert sands, was heated by the scorching sun, and soon produced a variety of poisonous snakes. Since Lucan regularly avoids lengthy mythological narration, the inclusion not only of an extended mythological excursus, but also of an extended mythological excursus whose content receives authorial condemnation comes as quite a surprise.⁵⁵ By denouncing the myth and then paradoxically relating it in great detail, however, Lucan follows a very specific paradigm of Latin didacticism. Lucretius, Manilius, and the *Aetna* poet all do precisely this.⁵⁶ If such posturing, for whatever reason or to whatever end, constitutes a recognizable feature of Latin didactic, then Lucan's departure from his normal practice at this particular textual moment encourages the reader to treat the episode itself as belonging to this tradition. Lucan is beginning to play the role of the didactic poet.

Second, we have already seen that Latin didactic regularly announces its themes through a series of indirect questions. Here, Lucan's didactic experiment begins with a series of indirect questions that appear to announce the themes that he will subsequently treat.⁵⁷ Not until line 622, after the invocation of poetic *cura* and *labor*, does the poet abruptly deny his own ability to

⁵⁵ For the *fabula* itself, see Fantham 1992 and Papaioannou 2005. The myth of Hercules and Antaeus (4.593-660) constitutes the only other comparable moment in the poem. There, however, Lucan does not denounce the myth, nor does he narrate it in his own voice, but rather puts it into the mouth of a *rudis incola* (4.592).

⁵⁶ For discussions of the role of myth in these poets and for further bibliography, see Gale 1994, Volk 2002: 221-2 and 2009: 190-2, and Taub 2008. Cf. Lausberg 1990: 195, who links Lucan with Lucretius, the *Aetna* poet, and Nicander. Nicander, however, does not protest against myth, nor does his mythological excursus play so prominent a role.

⁵⁷ Fantham 1992: 98 n.7 observes in passing that "the series of indirect questions is didactic in form". Wick 2004: 2.248 notes more vaguely that *cur* and *causa* "sind Schlüsselwörter sowohl der didaktischen als auch der aitiologischen Poesie". Papaioannou 2005: 233-4 compares the passage with Virgil's depiction of (epic) *fama* at *Aen.* 4.173-90 without taking into account other elements in the passage that point towards the didactic tradition.

provide satisfactory answers. In contrast to his *recusatio* to cosmological didactic, where he aggressively parades his superiority to didactic poets, Lucan playfully suggests his didactic impotence.⁵⁸ This passage constitutes an inversion or travesty of texts such as the opening lines of the *Georgics*, where Virgil piles up one indirect question after another as he outlines the subjects of the following books. Lucan's maneuver simultaneously aligns him with Virgil's didactic persona and distances him from Virgil's initial or ostensible positivism. It begins to seem as though didactic poetry as we know it may no longer be possible in the oppressive and unforgiving expanses of the Libyan desert.

Third, it is essential to recognize that didactic poets regularly use very specific digressions in programmatic ways to situate themselves within the didactic tradition.⁵⁹ The most familiar example is perhaps the Myth of Ages topos that appears first in Hesiod and then becomes a significant means of literary self-definition in the didactic works of Aratus, Lucretius, Virgil, and Manilius. Beginning with Lucretius, who adapts material from Thucydides 2.47-54, a plague narrative becomes another conspicuous example of this kind of topos. I suggest that Lucan invites us to read Cato's battle with the Libyan snakes against this very tradition. So much begins to emerge from *pestibus* in line 619. Out of the 19 occurrences of *pestis* in the *Bellum Civile*, thirteen come from Book 9, and all thirteen refer to the Libyan snakes or their poison (614, 619, 630, 724, 734, 744, 779, 787, 805, 844, 922, 926, 930).⁶⁰ In some sense, then,

⁵⁸ Viansino 1974: 91 connects the two passages but offers a reductive reading (“le leggi del genere letterario gli [sc. Lucan] impediscono di esaurire quella tematica didascalica con cui, ellenisticamente, pur dà varietà al suo poema”). Cf. Feeney 1991: 277-9.

⁵⁹ Gale 2011 provides a useful discussion of such programmatic digressions.

⁶⁰ At 630 *pestes* refers to the plagues inside Medusa's body, which later produces the Libyan snakes. The other occurrences are: 1.649, 4.370, 728 (again in reference to snake venom), 6.89, 97, 681. Raschle 2001: 244 traces this use of *pestis* back to Lucr. *DRN* 5.26, where *Lernaeaque*

Cato's battle with the snakes is simply a battle with plague. Indeed, *pestis* is precisely the word used to describe the literal plague that afflicts Pompey's troops at Dyrrachium in Book 6 (89 and 97).⁶¹ But it is possible to say more. Although *pestis* can refer concretely to anything deadly or destructive (*OLD* s.v. 3), the didactic plague topos develops a very specific connection between snakes and plague. In his adaptation of Nicander at *Georgics* 3.414-39, Virgil calls snakes "the bitter plague of cattle" (*pestis acerba boum*, 419). This moment looks forward to the end of the book, where Virgil treats the plague at Noricum in great detail (3.478-566). The essential point is that Virgil's version of Nicander uses snakes to foreshadow a much more serious pestilential outbreak.⁶² In his account of the plague on Aegina in *Metamorphoses* 7, Ovid turns this subtle connection into an explicit aition. What matters for us is that Aeacus, whose speech closely parallels the plague narratives of *DRN* 6 and *Georgics* 3, traces the actual outbreak of the plague to an infestation of snakes: "it is agreed that the flaw came to both springs and lakes and that many thousands of snakes wandered through the uncultivated lands and violated the rivers with their poisons" (*constat et in fontes vitium venisse lacusque, | miliaque incultos serpentum multa*

pestis refers to the hydra. Schwemmler 1916: 12-13 connects Lucan's use of the plural *pestes* at 6.681 with Manil. 4.662, also in reference to Libya's peculiar creatures, and then compares Manil. 4.667 *in poenas fecunda* [sc. *Libya*] with Lucan 9.620 *fertilis in mortes* [sc. *Libycus aer*]. Although such reminiscences may add didactic flavor to Lucan's text, other authors employ similar language. The Nurse in Seneca's *Medea*, for instance, refers to snakes from Libya and Taurus as *pestes* (681) and later characterizes flowers from Athos in the same way (720). Cf. 355, where the Chorus describes the Sirens as *pestes*.

⁶¹ Lausberg 1990: 182 + n.43 connects Lucan's Dyrrachium plague with the plagues of Lucretius, Virgil, Ovid, and the very beginning of the *Iliad*, and Migliorini 1997: 105-10 discusses, *inter alia*, certain Senecan parallels. The comparison between *Iliad* 1 and Dyrrachium warrants further investigation—not only does Lucan compare Caesar's rampart to the walls of Troy (6.48-9), but the entire scene constitutes one more delay before the eruption of full scale civil war at Pharsalus and thus mirrors the cessation of hostilities at the opening of the *Iliad*.

⁶² Leading up to the plague at Noricum, Virgil describes disease as "creeping" or "winding", much like a snake (*priusquam | dira per incautum serpent contagia vulgus*, *Geor.* 3.68-9).

per agros | errasse atque suis fluvios temerasse venenis, 7.533-35).⁶³ The *fontes*, *lacus*, and *fluvii* of Ovid's Aegina become the *fons unus* (9.607) of Lucan's Libya. So instead of subtly suggesting plague, as snakes do in Virgil, or instead of explicitly causing plague, as snakes do in Ovid, snakes dramatically become the plague in Lucan. From this perspective, Lucan's professed inability to explain the origins of the plague through an analysis of the Libyan climate (*aer*, 619) or soil (*solo*, 621) constitutes a rejection of Lucretius' own appeal to both air and earth as sources of *pestilitas* (6.1098-1102).⁶⁴ Through such allusions and corrections, the text itself prompts the reader to construe the entire excursus as a programmatic set-piece characteristic of Latin didactic.

Only by recognizing the presence of the didactic plague topos can we begin to understand the episode's extended critique of the didactic tradition and supposed value of scientific learning. Unlike other programmatic didactic digressions, the plague topos encourages the reader to reflect on the value and function of different intellectual traditions. In the plague narratives of both Thucydides and Latin didactic, doctors are unable to treat the disease effectively.⁶⁵ This is a theme that Lucan exploits. When Cato's dehydrated troops first arrive at the snake-infested

⁶³ Fantham 1992: 98 n.7, Raschle 2001: 178, and Wick 2004: 2.249 all note in passing the presence of snakes in Ovid's plague narrative.

⁶⁴ Wick 2004: 2.248-9 cites *DRN* 6.1095-1102 as a parallel for *Bellum Civile* 9.619, although she does not comment on Lucan's rejection of Lucretius' reasoning, and then observes that heat also plays an important role in the plagues of Virgil and Ovid. Fantham 1992: 98 n.7 suggests that Lucan's "stress on *aer* as a source of infection recalls the plagues of Lucretius, *Georgics* 3 and Ovid *Met.* 7". Cf. Raschle 2001: 178. It is worth noting that by rejecting Lucretius, Lucan may actually be siding with Thucydides, who emphatically refuses to treat the *aitiai* of the Athenian plague, restricting himself instead to an analysis of its symptoms (2.48.3). But whereas Thucydides hopes that his treatment may prove useful should another outbreak occur, Lucan harbors no such illusions.

⁶⁵ The medical art is ineffective: Thucyd. 2.47.4, Lucr. 6.1179-81, Virg. *Geor.* 3.548-50, Manil. 1.887, and Ovid *Met.* 7.561-64 (cf. 525-7, bracketed by Tarrant). What helps one victim regularly harms another: Thucyd. 2.51.2, Lucr. 6.1226-9, Virg. *Geor.* 3.509-11 and 549.

spring, they show an understandable reluctance to drink. As part of his moralizing rebuke, Cato points out that “the plague of the serpents is harmful [only] when blood has been mixed with it; they have poison in their bite and threaten fate with the tooth, but your drinks are free from death” (*noxia serpentum est admixto sanguine pestis; | morsu virus habent et fatum dente minantur, | pocula morte carent*, 9.614-6). Cato then dares to drink from the spring. These remarks display an unexpected level of scientific sophistication that fits well with first century medical knowledge. Celsus, for instance, makes the same basic point (*venenum serpentis, ut quaedam etiam venatoria venena... non gustu, sed in vulnere nocent*, 5.27.3).⁶⁶ In addition, he notes that a snake can be eaten quite safely, even though its bite may kill, and then pronounces it perfectly harmless both to stick one’s finger into a snake’s mouth, provided it is not bitten, and to suck venom from a snake-inflicted wound, provided one’s own mouth contains no sores. Elsewhere, Lucan takes this idea for granted in a striking simile that compares Curio to an Egyptian asp and Juba to its archenemy, the ichneumon (4.724-9). When the ichneumon provokes the asp, causing it to lunge forward, “it seizes [the serpent’s] throat with safe bite, falling short of deadly gore; then the ineffectual plague is pressed out and its jaws flow with poison spent in vain” (*tuto comprehendit guttura morsu | letiferam citra saniem; tunc inrita pestis | exprimitur faucesque fluunt pereunte veneno*, 4.727-29). In Book 9, then, Cato’s initial response suggests the practical value of a certain type of medical understanding. Since we do not return to the historical narrative until some 80 lines have passed, this impression lingers. And yet, when the snakes actually attack, Cato’s men do not stand a chance and his apparent medical expertise suddenly seems entirely irrelevant. As the general scurries from one wounded soldier to another,

⁶⁶ Raschle 2001: 174 calls the basic idea “ein Volksglaube” and cites Ovid *Met.* 7.535, a passage that has nothing to do with blood. Oddly enough, he then declares the same idea to be “eine Erkenntnis der antiken Medizin” and cites the Celsus passage in question.

he can offer only moral encouragement and the strength to face death, “a service greater than”, and hence emphatically different from or unconnected with, physical “health” (*quocumque vocatus* | *advolat atque ingens meritum maiusque salute* | *contulit, in letum vires*, 9.884-6).

Within the Thucydidean and didactic traditions, the failure of the medical profession to cope with the onset of the plague constitutes one concrete example of a larger societal breakdown, the ultimate collapse of all human *nomoi* and *technai*.⁶⁷ Lucan’s plague also effects a state of cultural and intellectual paralysis, and if the contagion first shows symptoms in connection with the *ars medica*, it quickly spreads. As Malamud has shown, the spring from which Cato’s men drink can be closely connected not only with the Pierian spring over which Ovid’s Muses contend with the Pierides in *Metamorphoses* 5, but also with the Pierian spring from which Lucretius derives poetical inspiration at *DRN* 1.921-50 and 4.1-25.⁶⁸ Of course Lucan’s hero does not find the pristine spring of traditional inspiration: “His Cato—a philosophical wanderer on the edges of the world like Epicurus and like Lucretius himself—finds in the midst of the desert a spring contaminated by Medusa’s snakes, filled not with *integros fontes* [*DRN* 1.927 and 4.2] but with venom”.⁶⁹ Whereas Lucretius drinks his pure waters and subsequently transmits his learning to the reader, “Lucan’s narrator uses the *locus* of

⁶⁷ Thucydides notes the failure of every ἀνθρωπεῖα τέχνη (2.47.4) and later analyzes the larger societal collapse at length (2.52-3). At *Geor.* 3.525-26, Virgil too points to the total failure of all human activity: *quid labor aut benefacta iuvant? quid vomere terras | invertisse gravis?* Cf. *Lucr.* 6.1272-86, *Manil.* 1.888-91, and *Ovid Met.* 7.564ff. One could say that a similar sort of cultural breakdown permeates the whole of the *Bellum Civile*.

⁶⁸ Malamud 2003. The key lies in the fact that the Pierian spring first appeared when Pegasus struck the ground with his hoof. Pegasus, of course, leapt forth from the severed neck of Medusa after Perseus decapitated her. Lucan, then, keeps the spring but changes the offspring of Medusa with which it is associated (snakes instead of winged horse). Fantham 1992, Malamud 2003, and Papaioannou 2005 discuss numerous connections between Ovid’s Perseus and Lucan’s Medusa story.

⁶⁹ Malamud 2003: 43. Leigh 1997: 265-6 also connects Cato and Lucretius’ Epicurus.

the spring to lament the fact that all his *cura* and *labor* will never lead to knowledge”.⁷⁰ While Malamud is on the right track, this is not entirely accurate. During Cato’s encounter with the Libyan snakes, Lucan displays a great deal of learning, the truth-value of which is nowhere called into question. Moreover, Lucan reveals a profound understanding of astronomy and geography elsewhere in this very book—he can discuss the origin and nature of the Syrtes (303-18), argue that Libya is part of Europe on meteorological grounds (411-20), and describe in detail the peculiarities of various celestial phenomena at extreme southerly latitudes (493-97 and 528-32, 538-43, 533-37).⁷¹ Scientific certainty is not always attainable, but it never remains entirely out of reach. Since the spring itself—along with its poisonous snakes—belongs to the plague topos of Latin didactic, we need to read its contamination from a generic perspective. At this particular moment, Lucan does not lament the absolute impossibility of attaining knowledge. Rather, he exposes the uselessness of the knowledge that the didactic tradition transmits. In a

⁷⁰ Malamud 2003: 43.

⁷¹ For Lucan’s knowledge of the ethnographic tradition on Libya, see Thomas 1982: 108-23. Note that even the supposedly false aition for the snakes ends in a way that makes it seem rather plausible. Lucan describes the drops of blood falling onto the sand in scientific terms, emphasizing the generative interaction of heat and moisture (*virus stillantis tabe Medusae | concipiunt [sc. tellus and arva] dirosque fero de sanguine rores, | quos calor adiuvit putrique incoxit harenae*, 9.697-99). Although the creation of life from blood constitutes a common mythological motif, these lines recall the creation of animal life after the flood at *Met.* 1.416-37. In particular, Ovid uses similar language to set forth the basic scientific principle upon which Lucan relies: *quippe ubi temperiem sumpsere umorque calorque, | concipiunt et ab his oriuntur cuncta duobus* (*Met.* 1.430-31). For the distinguished scientific and/or philosophical history of this idea, see Bömer 1969: 133-4 and Hahm 1977: 66-71. Significantly, these lines lead into the birth of Python, the most terrible of snakes. By way of contrast, neither Apollonius nor Ovid shows a similar interest in heat and moisture when describing the origins of the Libyan snakes. Although Loupiac 1998: 68 implausibly declares that the spontaneous generation of the snakes evokes that of the bees in *Georgics* 4, Virgil does emphasize the interaction of heat and moisture (*interea teneris tepefactus in ossibus umor | aestuat*, 4.308-9, and *ut aestivis effusus nubibus imber | erupere*, 4.312-13).

time of plague and/or civil war, the didactic poetry of Lucretius will prove no more profitable than Cato's medical expertise. One intellectual tradition after another succumbs to the disease.⁷²

This becomes clear when the snakes actually attack. At this point, the text suddenly undergoes a certain kind of bifurcation. There are now two distinct narrative planes, one on which Lucan shares his didactic learning with the reader and another wherein Cato and his men fall victim to the snakes.⁷³

has inter pestes duro Cato milite siccum
emetitur iter, tot tristia fata suorum
insolitasque videns parvo cum volnere mortes.
signiferum iuvenum Tyrrheni sanguinis Aulum
torta caput retro dipsas calcata momordit.
vix dolor aut sensus dentis fuit, ipsaque leti
frons caret invidia nec quicquam plaga minatur.
ecce, subit virus tacitum, carpitque medullas
ignis edax calidaque incendit viscera tabe.
ebibit umorem circum vitalia fusum
pestis et in sicco linguam torrere palato
coepit; defessos iret qui sudor in artus
non fuit, atque oculos lacrimarum vena refugit. (9.734-46)

Among these plagues, Cato, with his sturdy soldiers, measures out the dry journey, watching so many sad fates of his men and unaccustomed deaths accompanied by a small wound. Aulus, the young standard bearer of Etruscan blood, was bitten by a dipsas, its head twisted back, after he had stepped on it. Scarcely was there pain or sensation of the tooth, and the appearance itself of death is free from ill-will, nor is the blow at all threatening. Behold, the venom advances in silence and a consuming fire seizes the marrow and inflames the innards with hot decay. The plague drinks up the moisture

⁷² For another scene of polluted or perverted inspiration, see Masters 1992: 25-7 and Leigh 1999 on the Massilian grove that Caesar desecrates in Book 3.

⁷³ Tesoriero 2005: 206-9 analyzes a similar split between poet/reader and literary character at 9.950-79. There, Caesar wanders aimlessly around the ruins of Troy, unable to appreciate the site because, unlike Lucan and the reader, he has not read the *Aeneid*. Leigh 1997: 277-9 considers several passages where Lucan addresses or “colludes” with the snakes, thereby setting himself in opposition to Cato and the troops. Cf. Masters 1992, who deals at length with Lucan’s “fractured voice” (pp. 87-90 in particular). Although the phenomenon I am concerned with is not entirely the same, it relies on the idea that Lucan becomes a unique and active character within the body of the poem.

poured around his vitals and begins to parch the tongue on his dry palate; there was no sweat to go over his tired limbs and the vein of the tears fled from his eyes.

For our purposes here, I want to underscore the epistemological distance that separates Cato and Aulus from Lucan and the reader. On the one hand, neither Cato nor Aulus understands the nature of the situation. Cato, in fact, becomes a mere witness or spectator who gazes helplessly and without understanding at a bizarre show (note *illo teste* at 887, and *spectator* at 889).⁷⁴ Aulus too remains fundamentally ignorant, a virtual caricature of Virgil's Eurydice who inadvertently steps on a hydrus or "water snake" (rather than dipsas or "thirst snake") at *Geor.* 4.457-9. Of course the present infection leads to an unbearable form of dehydration, forcing Aulus to dig through the sand in search of moisture and then to swallow salt water from the sea. Like the plague victims of Thucydides and the didactic tradition, Aulus cannot quench his thirst, and he soon dies trying to drink the blood from his veins.⁷⁵ But even then the Etruscan youth fails to "perceive" the nature of his death, "thinking" rather that this is simply thirst (*nec sentit fatigue genus mortemque veneni, | sed putat esse sitim*, 9.758-9). The standards fall to the ground and Cato orders them to be picked up in great haste: "it was not allowed for anyone to

⁷⁴ Leigh 1997: 273-6 well discusses the implications of Cato as a spectator in the amphitheater. Cf. Papaioannou 2005, who contrasts the importance of spectacle here with its presence in Ovid's Perseus narrative.

⁷⁵ As the commentaries of Raschle 2001 and Wick 2004 make abundantly clear, Aulus' sufferings echo the plight of Ovid's Erychthon (cf. Cazzaniga 1957: 35, Leigh 1997: 269, and Migliorini 1997: 111-3) and are described in language reminiscent of erotic elegy. It is not by accident, however, that Thucyd. 2.49, Lucr. 6.1163-78, and Ovid *Met.* 7.554-60 all depict plague victims who suffer from burning heat and dehydration and who attempt in vain to slake their thirst by various extreme measures (cf. the fiery heat associated with Virgil's plague at *Geor.* 3.479, 482-5, 563-6). The first victim of Lucan's Libyan snakes, then, dies a death strongly reminiscent of the plague, a fact emphasized by *pestis* at 744. Note that Lucan's literal plague at Dyrrachium also causes burning heat (*igneaque in voltus et sacro fervida morbo | pestis abit*, 6.96-7).

learn that thirst possessed this kind of power” (*discere nulli | permissum est hoc posse sitim*, 9.761-62). Nobody within the historical narrative of the poem learns anything at all.⁷⁶

On the other hand, the reader of the poem learns a great deal. First, Lucan names the snake (*dipsas* at 738). Then, through the interjection *ecce* at line 741 (and repeated at 789 and 822), he focuses our attention on the physical processes that begin to unravel deep within the hidden recesses of Aulus’ body. Since we alone apprehend the profound connection between the snake, its name, and its powers, we too are alone in appreciating the order and reason behind Aulus’ suffering: the “thirst snake” (διψάς) produces dehydration or “thirst” (δίψα). This is a lesson that the reader receives again and again as the battle continues, for Lucan takes great pains to make sure that the names of his serpents correspond precisely with their lethal powers and even modifies the physical realities of certain snakes or combines attributes from different snakes so as to produce a strong etymological effect.⁷⁷ The seps provides an instructive

⁷⁶ We can also read Aulus’ death against Mopsus’ death at Apollonius of Rhodes 4.1502-36, where Mopsus inadvertently steps on an unnamed snake and dies. Although Mopsus’ companions mourn and bury him, no such ceremony follows Aulus’ rather more gruesome and ignoble fate. Lucan’s excess seems to parody Apollonius’ solemnity. As scholars such as Fantham 1992 and Wick 2004: 1.13-9 have shown, Lucan’s depiction of Cato in the Libyan desert draws heavily on *Arg.* 4. It is possible, however, that the snake battle as a whole expands and parodies Mopsus’ misfortune. Instead of one victim, Lucan gives us many; instead of one anonymous snake, Lucan catalogues the names of a veritable army; instead of burial rites and lamentation, disfigured corpses decorate a comically absurd landscape (cf. 9.803-4). This reading fits well with Batinski 1991, who emphasizes the ironic tension between epic conventions and the bizarre nature of the battle, and Johnson 1987: 35-66 and Leigh 1997: 267-73, who see Lucan undermining or even laughing at Cato’s outdated Stoicism. Noting Aulus’ inability to master his thirst and Cato’s willingness to cover up the failure, Leigh 1997: 273 characterizes the entire scene as an allegory for “the impotence of philosophy” (cf. 2000: 99-102). For other unsuspecting pedestrians who inadvertently step on snakes, see Virg. *Aen.* 2.379-82, Stat. *Theb.* 4.95-100, and Diod. Sic. 20.42.2 (part of Ophellas’ march through Libya).

⁷⁷ Cazzaniga 1957, Aumont 1968, Migliorini 1997: 110-9, 122-3, Raschle 2001, and Wick 2004 all treat the ways in which Lucan transfers or combines snake attributes. Cazzaniga 1957: 36-7, 38, 39-41, Eldred 2000, Wick 2004: 2.278-82, and Landolfi 2007 discuss Lucan’s interest in the etymologies of the serpents’ names. Wick 2004: 2.280 emphasizes that Lucan’s freedom with

example.⁷⁸ Its Greek name (σήψ) means “putrefying sore” and in the catalogue Lucan describes it as “dissolving bones along with the body” and “putrefying” (*ossaque dissolvens cum corpore tabificus seps*, 9.723). During the subsequent battle, a seps attacks Sabellus and the putrefaction begins: his skin dissolves, his limbs swim with gore, his thigh muscles melt, the membrane that holds the stomach together bursts apart, and he soon becomes nothing but a bodiless wound (*iamque sinu laxo nudum sine corpore volnus*, 769). The “putrefying sore” turns Sabellus into one massive “putrefying sore”. It is essential to note, however, that the Greek σήψ behaves rather differently—in addition to swelling, numbness, and bleeding, it causes the hair to fall out and a certain white rash to spread.⁷⁹ Lucan alters the physical details of the natural historical tradition in order to produce an exact correspondence between snake name and snake wound.⁸⁰ But once again, his scientific knowledge and intellectual precision are of absolutely no use to those who live in the “real world” of the poem. Like Cato and Aulus, the troops always remain in the dark. They are literally lost (*nec, quae mensura viarum | quisve modus, norunt caelo duce*, 9.846-47) and imagine themselves to be travelling towards the antipodes, with Rome itself—rather than snakes—under their feet (*imus in adversos axes, evolvimur orbe, | terga damus*

natural historical details does not constitute a new phenomenon and usefully compares passages from Apollonius and Virgil. Eldred 2000 and Papaioannou 2005 read the connection between the snakes’ names and their powers against the Medusa *fabula* and attempt to interpret these powers as allegories for the potency of language and/or (epic) poetry and the (epic) poet.

⁷⁸ For Lucan’s treatment of the seps, see in particular Eldred 2000: 67. In reference to this episode, Aumont 1968: 118 n.46 rightly speaks of “réalisme brutal et caricatural”, “parodie”, and a likeness to the “dessin animé”.

⁷⁹ Thus Philumenus 23.2, cited by Wick 2004: 2.324. Cf. Nicander *Ther.* 326-33, on the σηπεδών.

⁸⁰ Lucan shows an interest in the connection between names and nature at the human level as well (e.g., Caesar and *caedo*). Cf. Feeney 1986 on Pompey’s cognomen.

ferienda Noto; nunc forsitan ipsa est | sub pedibus iam Roma meis, 9.876-8). Physical and natural historical or scientific disorientation mirror one another.⁸¹

The epistemological split between Lucan and the reader, on the one hand, and the actual characters of the poem, on the other hand, can be read against the traditions of didactic poetry. Just as Aratus insists on the utility of the *Phaenomena*, so Nicander presents the *Theriaca* as being entirely practical:

σὲ δ' ἂν πολύεργος ἀροτρεὺς
βουκαῖός τ' ἀλέγοι καὶ ὀροϊτύπος, εὐτε καθ' ὕλην
ἢ καὶ ἀροτρεύοντι βάλῃ ἐπι λοιγὸν ὀδόντα,
τοῖα περιφρασθέντος ἀλεξητήρια νόσων. (*Ther.* 4-7)

The much toiling ploughman and the herdsman and the woodcutter would respect you, whenever in the wood or even while at the plough [one such animal] casts its deadly tooth upon him, since you think about such remedies for diseases.

The entire poem is ostensibly based on the belief that the animals and injuries it describes actually afflict actual people and that the attentive reader will be able to come to the rescue. In his adaptation of Nicander in *Georgics* 3, Virgil too underscores the practical applications of his poem. There he emphatically urges the reader to learn the proper technique of fumigation (*disce et odoratam stabulis accendere cedrum*, 3.414)⁸² and appeals directly to the shepherd to take up arms against the snakes (*cape saxa manu, cape robora, pastor, | tollentemque minas et sibila colla tumentem | deice*, 3.420-2).⁸³ But no such safeguards and no such remedies exist in the

⁸¹ The soldiers' confusion contrasts markedly with Lucan's astronomical and geographical understanding of the Libyan continent (see above). The troops may be lost, but Lucan and the reader are not. Beaujeu 1979: 221-2 treats the astronomical confusion involved in the soldiers' lament in more detail, and Raschle 2007: 69-75 discusses the allusion to the *antipodes* in *forsitan ipsa est | sub pedibus iam Roma meis*.

⁸² Thomas 1988: 2.119 notes that the imperative of *disco* "occurs only here in the poem, and obviously creates a strong didactic tone".

world of the *Bellum Civile*. Cato's army has reached the ends of the earth (note *miles... claustra ferit mundi*, 9.864-5), where traditional forms of knowledge—whether didactic, medical, mythological, or even moral—reach their limits and collapse. In the case of didacticism, the example of Nasidius brings the point home with subtle humor: “a scorching prester struck down Nasidius, a farmer of the Marsian field” (*Nasidium Marsi cultorem torridus agri | percussit prester*, 9.790-1). True to its etymologically ambiguous name, the πρηστήρ—ultimately derived from πίμπρημι, both “to inflate” and “to burn”—causes Nasidius' body to swell beyond recognition, like a ship's sails filled with billowing wind or boiling water that overflows a heated cauldron.⁸⁴ Since the Marsians traditionally have certain immunities to and magical powers over snakes, it is not without humor that this particular Marsian's exotic expertise fails him utterly when he most sorely needs it.⁸⁵ More importantly, however, it is precisely the rural *cultores* and *pastores* whom the readers of Nicander and Virgil are supposed to assist with their newfound didactic knowledge. The irony only increases when we realize that the prester does not actually figure in the *Theriaca* at all—even if Nasidius had brought his Nicander to Libya, he would have

⁸³ Thomas 1988: 2.120 observes that 3.422 reworks Nicander *Ther.* 179-80. It should be added that Macer adapts the same Greek lines and may serve as an intermediary (*tumido resonantia sibila collo*, fr. 55 Hollis).

⁸⁴ For the etymological connection between πρηστήρ and πίμπρημι, see Chantraine 1968: 902-3. Morford 1967b: 128 n.1, Raschle 2001: 285-6, and Landolfi 2007: 135-6 observe the importance of both etymologies for Lucan. Cf. Cazzaniga 1957: 41, Eldred 2000: 68, and Wick 2004: 2.337, 341.

⁸⁵ Leigh 1997: 273 n.102 rightly notes that this is one of Lucan's “very best jokes”. Phillips 1995: 399-400 and Wick 2004: 2.338 see no irony here and attempt to rationalize Lucan's failure to make Nasidius a magically potent Marsian along traditional lines, as at Virg. *Aen.* 7.750-60 and *Sil. It.* 8.495-510. The Virgilian passage is particularly instructive. There, Virgil sings of Umbro's Marsian snake powers and then pathetically laments that these were of no use against the blow of the Dardanian spear. Lucan may very well be parodying this kind of scene.

been totally out of luck. Cato's battle with the Libyan snakes exposes the complete divorce between didactic learning and real world action.

The appearance of the Psylli in the episode's concluding scene reinforces this point. Lucan is careful to foreground the tribe's magical incantations (note *cantus* at 9.895 and 914) and then declares that when the serpents attack by day, the true "wonders of the magical race" (*magicae miracula gentis*, 9.923) are revealed:

nam primum tacta designat membra saliva,
 quae cohibet virus retinetque in volnere pestem;
 plurima tunc voluit spumanti carmina lingua
 murmure continuo, nec dat suspiria cursus
 volneris aut minimum patiuntur fata tacere.
 saepe quidem pestis nigris inserta medullis
 excantata fugit. (9.925-31)

For first he marks the limbs by touching them with saliva, which keeps the poison in check and holds back the plague in the wound; then he rolls forth a great many spells with frothing tongue and continuous murmur, nor does the progress of the wound allow him to catch his breath and death does not suffer him to be silent for even a little bit. Often indeed the plague that has been introduced to the black marrow is chanted away and flees.

If this procedure meets with resistance, the healer licks the stubborn wound and "efficaciously draws death from the cold body and spits it out" (*extractamque potens gelido de corpore mortem* | *expuit*, 9.935-6). For our purposes, two points are crucial, one at the literal and one at the figurative level. At the literal level, the Psylli's curative procedures stand entirely outside the traditions of Greco-Roman science with which Lucan has been hitherto concerned. In stark contrast to the scientific sophistication of the *Theriaca*, the Psylli rely on magic. They employ *cantus*, *carmina*, or *murmur*, and their most astonishing behavior is *excantare*—even their backup methodology seems to fall under the rubric of the astonishing or supernatural.⁸⁶

⁸⁶ Phillips 1995: 396-9 rightly emphasizes that "Lucan considers in the category of magic every act the Psylli perform in the episode following the announcement of the 'marvels of a magic

Precisely because Lucan's Psylli exist in a world of *miracula*, not rational scientific discourse, they alone are capable of taking effective action at a time of social and intellectual chaos. Greek science and Cato's Roman philosophy appear laughably helpless.

At the figurative level, we need to read the Psylli's magical powers against the history of didactic poetry. The appearance of the Psylli corresponds to the discussion of treatments and remedies that occupies the second half of Nicander's *Theriaca*,⁸⁷ and their *carmina* and *cantus* clearly suggest the traditional tools of the literary *vates*.⁸⁸ In some sense, these are "poets" or, to

race' [sc. 9.923]" (p. 397, emphasis mine). The powers of the Psylli are variously reported. Plutarch *Cato min.* 56.3 and Callias *FGrH* 564 F 3 (= Aelian *NA* 16.28) emphatically present the Psylli as magical, and Hesychius contains an intriguing although unspecific entry under "Psyllian magician" (Ψυλλικός γόης· ὁ τῶν Ψύλλων· οἱ δὲ Ψύλλοι ἔθνος Λιβύης). Those who do not mention magic in connection with the Psylli include: Nicander fr. 32; Agatharchides *FGrH* 86 F 21a-b (= Pliny *Nat.* 7.14 + Aelian *NA* 16.27); Varro apud Priscian *Inst.* 10.32; Cinna fr. 10 Courtney (= 12 Hollis); Strabo 13.1.14, 17.1.44; Pliny 8.93, 21.78, 28.30; Suetonius *Aug.* 17.4; Pausanias 9.28.1; Cassius Dio 51.14; Aelian *NA* 1.57. Of course, it is often difficult to decide whether a given author considers something magical. Thus Strabo compares the Ophiogeneis to ἐπιδοί and suggests they may have descended from the Psylli (13.1.14) but elsewhere declares that the Psylli have φυσικήν τινα ἀντιπάθειαν... πρὸς τὰ ἔρπετά (17.1.44). Similarly, Pliny believes nature herself (*illa domina rerum omnium*) gave the Psylli a certain *repugnantia* against snakes (21.78) but also states that all humans have an innate *venenum* against serpents, namely, saliva (7.15). For bibliography on the Psylli and further references, see Morel 1928, Treidler 1959, Phillips 1995, and Migliorini 1997: 119-21.

⁸⁷ See again Lausberg 1990: 187-9. Note that before they start healing the wounded, the Psylli build a medicated fire that allows the soldiers to pass the night in safety (9.915-21). Several of the ingredients that go into the fire appear in Nicander's discussion of treatments and remedies: elder (*ebulum* 9.916 and ἀκτῆ *Ther.* 615), tamarisk (*tamarix* 9.917 and μυρική *Ther.* 612), all-heal (*panacea* 9.918 and πάνακες *Ther.* 565, 685, cf. 508), centaur (*centaurea* 9.918 and Χείρωνος... ῥίζαν *Ther.* 500). More importantly, the soldiers' peaceful slumber contrasts with their earlier inability to rest free from attack (9.839-46). It is not by chance that Nicander himself programmatically assures the reader that, with the help of his *Theriaca*, he will soon be able to put to flight all sorts of wild animals when he wishes to go to bed or take a nap (*Ther.* 21-34 and 55-6). The Psylli fulfill Nicander's initial promise. For a similar idea, see Virg. *Geor.* 3.435-9.

⁸⁸ D'Alessandro Behr 2007: 168 makes this point as well. She, however, reads the Psylli allegorically, equating the poison of the snakes with "laudatory propaganda" (2007: 169) and suggesting that the Psylli symbolize the potential of poetry, or simply speech itself, to combat

be more precise, “didactic poets”. Indeed, to describe a poet as actually doing the thing about which he writes or sings constitutes a common trope in Latin literature.⁸⁹ In *Sermones* 1.10, for instance, Horace describes Furius Bibaculus as personally slaughtering Memnon (*turgidus Alpinus iugulat dum Memnona dumque | diffindit Rheni luteum caput, haec ego ludo...*, 1.10.36-7). The point is that Bibaculus has written turgid bombastic verses about Memnon’s death at the hands of Achilles and thereby managed to ruin, or “slaughter”, his subject.⁹⁰ Lucan reverses this trope in a remarkable way: the Psylli are in fact treating snake bites, one of the major subjects of Greek and Latin *Theriaca*, by singing literary *carmina*. Unlike Horace’s Bibaculus, the Psylli actually are poets who do the very thing about which they sing. From this perspective, the Psylli parallel the Druids, and just as the appearance of the Druids needs to be read against Lucan’s *recusatio* to cosmological didactic, so the appearance of the Psylli needs to be read against Lucan’s inability to give a didactic account of the origins of the Libyan snakes and the failure of the didactic tradition to transmit useful information to its readers. Where the didactic tradition fails, an outside or foreign counterpart dramatically succeeds. Indeed, the potent efficacy of the Psylli’s African *carmina* dramatically underscores the extent to which Greco-Roman didactic poets fall short of this magical standard. No reader of the *Theriaca* tradition will find anything in such poems that would allow him to reproduce the healing remedies of the Psylli. Such figures do not need the works of Nicander and Macer to identify and treat snake bites, nor can they pass on their methods to outsiders. Lucan highlights this point with characteristic humor: “it is easy

such malignant forces. Although I sympathize with this reading, it fails to take into account the broader context of the passage.

⁸⁹ See Lieberg 1982.

⁹⁰ For more on these lines and the identification of Horace’s “Alpinus” with Bibaculus, see Lieberg 1982: 56-63 and Courtney 1993: 197-8.

for the Psylli”, after having sucked the poison from an infected wound, “to know even by the taste of the venom which snake’s bite he has overcome” (*cuius morsus superaverit anguis | iam promptum Psyllis vel gustu nosse veneni*, 9.936-7)—easy for the Psylli, but not for anyone else. In contrast, then, to the poets of the Greco-Roman didactic tradition, these are “anti-didactic poets”, and it is significant that they and their lifesaving incantations belong to the same corrupted landscape as the poisoned *fons* with which the entire episode begins. This is a landscape in which didactic poetry cannot be put into action. Only the primitive irrational voice of the non-Hellenized *vates* succeeds in harnessing the power of poetry.⁹¹

Cato’s encounter with the Libyan snakes, then, problematizes the value and the purpose of both scientific knowledge and didactic poetry. By making conspicuous use of the ancient *Theriaca* and plague traditions, Lucan appropriates the generic role of the didactic poet and casts the reader as his didactic addressee. When the battle actually begins, it becomes clear that a certain epistemological distance now separates Lucan and reader, who engage in the traditional didactic enterprise, from the characters in the historical narrative of the poem, who have no access to such didactic learning and so make easy targets for the snakes. On the one hand, this shows the failure of scientific learning in general. The plague topos itself exposes the futility of all intellectual disciplines and suggests that human learning simply cannot cope with or fight back against a perplexing and sometimes aggressive natural world. This is precisely how Lucretius and Virgil deploy the topos, and their plague narratives provide clear models for

⁹¹ The Psylli can also be compared with Erictho who, as another outsider, is able to fulfill certain roles associated with the literary *vates*. Note, however, that Cato’s encounter with the Psylli reverses Sextus Pompey’s encounter with the witch. Sextus misguidedly seeks out the evil Erictho, whereas Fortuna herself (9.890-1) brings together a virtuous Cato and the benevolent Psylli. So, too, Erictho displays a certain friendliness with snakes and uses them in her concoctions (see 6.488-91, 656, 670-94), while the Psylli deploy their own spells against snakes. For Erictho’s associations with poetry, see O’Higgins 1988 and Masters 1992.

Lucan. On the other hand, Lucan's engagement with the *Theriaca* tradition focuses this critique on didactic poetry in particular. Although a writer like Nicander claims to equip his reader with practical learning based on natural history and medical theory, it seems that when poisonous animals actually attack, this kind of poetry is of absolutely no use. The appearance of the *Psylli* reinforces this point. Although they are poets, the *Psylli* stand outside the traditions of Greco-Roman literary history, and the potency of their foreign magical songs contrasts dramatically with the inefficacy of Greco-Roman science. In the primordial chaos of Libyan desert, didactic poetry seems to have nothing to offer and can serve no useful purpose. Like Cato's Roman *virtus*, it appears to have reached its limits.

3. Acoreus and the Nile

Book 10 of the *Bellum Civile* brings Caesar to Alexandria. After dining in opulence at the royal court, the general interrogates Acoreus, an aged Egyptian priest, about the peculiar nature of the Nile. Caesar claims to be eager to learn the causes of the river's summer flood and the location of its source, going so far as to promise to abandon civil war altogether in return for the revelation of Acoreus' secret knowledge. The priest immediately launches into a learned exposition that begins with a brief introduction (10.194-8) and then falls into two roughly equal halves, his explanation of the Nile's summer flood (10.199-267) and his account of the Nile's source (10.268-331). At this point the narrative breaks off, and Lucan directs the reader's attention to Pothinus, who has been plotting Caesar's assassination. Although the episode has

received relatively little scholarly attention,⁹² several recent critics have emphasized its ethical implications. Greek and Roman writers regularly conceive of the Nile as a kind of liminal space or natural boundary, imagining its source to lie beyond the Ocean or at the Antipodes.⁹³ As Romm notes, its origins represented “a seemingly unattainable goal” and the river itself “served, in a number of early imperial texts, as the object of imaginative expeditions of conquest seeking to extend Roman power beyond the edges of the earth”.⁹⁴ Caesar’s request constitutes a figurative example of this hubristic imperial impulse.⁹⁵ He himself conceives of his inquiry in militaristic terms,⁹⁶ and Acoreus explicitly compares his desire to learn about the Nile to the failed expeditions of Cambyses, Sesostris, and Alexander, all undertaken for precisely the same reason (10.268-82). This type of attempted boundary violation carries extremely pejorative connotations and characterizes Caesar as would-be tyrant bent on world domination.⁹⁷ Such readings situate the episode within the poem as a whole and allow us to stop treating it as a mere digression, unconnected to Lucan’s broader concerns.⁹⁸ This revaluation can be taken further.

⁹² Debate has generally focused on source criticism. There are two camps, both of which identify Seneca as Lucan’s primary source: those who follow Diels 1885 argue for Sen. *NQ*. 4a and those who follow Pichon 1912: 41-9 argue for the lost *De situ et sacris Aegyptiorum*. See Lausberg 1989: 1934-5.

⁹³ Romm 1992: 149-56.

⁹⁴ Romm 1992: 151.

⁹⁵ Romm 1992: 154 and Barrenechea 2010: 268.

⁹⁶ Barrenechea 2010: 260-1, 264-8, 272.

⁹⁷ Bartsch 1992 discusses the importance of boundary violation in the *Bellum Civile*.

⁹⁸ Barrenechea 2010 goes further than earlier readings in attempting to make sense of the episode within Lucan’s broader framework. Also important in this regard are Romm 1992: 149-56 and Berti 2000. Cf. Schrijvers 2005: 29-30, who briefly discusses the episode within the context of Lucan’s scientific interests, and Rossi 2005.

In what follows, I argue that Caesar's inquiry into the Nile makes a significant contribution to Lucan's critique of scientific poetry. In the liminal chaos of the North African desert, Cato's encounter with the Libyan snakes suggests that science and didactic poetry offer no practical advice and serve no useful purpose, no matter how accurate the information they transmit. But in another liminal space, along the banks of a primordial river, Caesar's conversation with Acoreus suggests that there may be a radically different kind of scientific poetry. Acoreus, another foreigner, belongs to the tradition of cosmological didactic, and his appearance in Book 10 mirrors the appearance of the Druids in Book 1. But unlike the Druids, who sing straightforward songs about the natural world and so inspire their fellow countrymen, Acoreus is manipulative and deceitful, a figure against whom readers should be on guard and one who employs his claims to scientific erudition in the service of the one goal that truly matters, Caesar's ultimate defeat. This is politically engaged didactic, and it constitutes an act of war.

Before we can see how Acoreus' performance contributes to Lucan's critique of the didactic tradition, it is necessary to recognize that Acoreus belongs to the tradition of cosmological didactic. Three basic arguments support this reading. First, when he initially asks Acoreus about the Nile, Caesar declares that there is nothing he would rather know than "the causes of the river, hidden through so many ages, and its unknown source" (*fluvii causas per saecula tanta latentis | ignotumque caput*, 10.190-1). The combination of *causa* and *latere* recalls Lucan's own *recusatio* to cosmological didactic and immediately implies that the song to follow will belong to that tradition.⁹⁹

⁹⁹ Cf. Rossi 2005: 241-3, who suggests that Caesar's language in this passage "is manifestly modeled on" (p. 242) programmatic statements of Lucretius and Virgil's *recusatio* to cosmological didactic. Dinter 2005: 303 + n.41 connects *caput*, here and at 10.295, with other *capita* in the poem. That Caesar looks for the river's head (rather than, e.g., its *fons* or *origo*),

Second, numerous critics have compared Acoreus with Virgil's Iopas.¹⁰⁰ Like Iopas, Acoreus sings about natural phenomena at a royal banquet. His account of the Nile's summer flood also begins with a relatively lengthy description of the planets (10.199-218) that corresponds to Iopas' first topic, the moon and the sun (*hic canit errantem lunam solisque labores, Aen.* 1.742). Since Iopas' song belongs to a tradition of miniature cosmological didactic poems or set-pieces, the comparison with Iopas further associates Acoreus with didacticism.¹⁰¹ This connection receives additional weight due to the fact that the planets do not figure prominently in other ancient accounts of the Nile's flood.¹⁰² Acoreus' interest in planetary phenomena thereby encourages a comparison with Iopas and the Aratean tradition more generally. But in addition to Iopas, Ovid's Pythagoras belongs to this same tradition of didactic miniatures and provides an essential model for Lucan's Egyptian priest.¹⁰³ Like Acoreus, Ovid's Pythagoras appears in the last book of an epic poem, addresses a Roman ruler (Numa), and teaches his interlocutor a lengthy lesson about natural philosophical phenomena, including the planets. Moreover, Pythagoras celebrates the causes of things (*causas rerum*, 15.68) and declares that he will sing about that which lies hidden (*quaeque diu latuere, canam*, 15.147; cf.

especially after having just mentioned Pompey (10.184), may further imply that he views his inquiry as a militaristic endeavor parallel to civil war. On 10.184, see Barrenechea 2010: 264.

¹⁰⁰ Zwierlein 1974: 61-4, Tucker 1975: 19-20, Lausberg 1990: 183, Berti 2000: 161, Schrijvers 2005: 30, Barrenechea 2010: 268-9. With the exception of Lausberg, all of these critics also compare Acoreus' lengthy speech, delivered at Caesar's request, to Aeneas' extended narrative, solicited by Dido.

¹⁰¹ For this tradition, see Volk 2005b.

¹⁰² The one exception is the sun, which figures later in Acoreus' account in two very different and non-astrological roles (10.247-54 and 258-61). Herodotus also attaches importance to the sun, but again in a non-astrological context (2.24-5; cf. Diod. Sic. 38.8-12).

¹⁰³ For Ovid's Pythagoras as a didactic figure, see again Chapter 1.2.

quodcumque latet [sc. *docebat*], 15.72). Caesar's encounter with Acoreus and his request to learn about hidden causes show close affinities with Ovid's presentation of Pythagoras. Both Iopas and Pythagoras encourage the reader to construe Acoreus as a poet of cosmological didactic.

Third, the origins of the world constitute a frequent topic of such cosmological didactic miniatures. In *Argonautica* 1, for instance, Apollonius' Orpheus begins his didactic song by describing the primordial chaos out of which earth, sky, and sea were eventually separated (1.496-8). So too in the sixth *Eclogue*, Silenus' didactic song takes its point of departure from the confused jumble of *semina* that produced all things (6.31-6). Acoreus' meandering account of the Nile's flood serves a similar function. Two particular passages suggest this interpretation, both of which configure Acoreus as a poet of cosmological didactic. On the one hand, Acoreus establishes an intimate connection between the Nile and the formation of the current cosmic framework or *conpages*.¹⁰⁴ Acoreus considers that although some rivers burst forth from the veins of the earth without god's active involvement, "certain waters began at the time of the framework itself along with the whole, and these waters the creator and artisan of things controls under a sure law" (*quasdam* [sc. *aquas*] *conpage sub ipsa | cum toto coepisse reor, quas ille creator | atque opifex rerum certo sub iure coerces*, 10.265-7).¹⁰⁵ The origins of the Nile and the current cosmic *conpages* merge or coincide, and Acoreus' song therefore describes a primordial

¹⁰⁴ See, again, Lapidge 1979: 360-2 on 1.72-80, and cf. Schotes 1969: 18-21.

¹⁰⁵ This passage adapts Sen. *NQ.* 3.22: *aliud est aquarum genus quod nobis placet coepisse cum mundo: sive ille aeternus est, hoc quoque fuit semper, sive initium aliquod est illi, haec quoque aqua cum toto disposita est.*

cosmological phenomenon that is connected with the initial appearance of the present world order.¹⁰⁶

On the other hand, Acoreus configures the Nile's flood itself as an event of cosmological significance. After declaring that his topic will be the *sacras... leges* (10.198) that bind the world together, Acoreus establishes a cosmic framework for his song by discussing the planets and comparing the Nile to Ocean. He then considers the river's flood:

dare iussus iniquo
temperiem caelo mediis aestatibus exit
sub torrente plaga, neu terras dissipet ignis
Nilus adest mundo contraque incensa Leonis
ora tumet Cancroque suam torrente Syenen
inploratus adest, nec campos liberat undis
donec in autumnum declinet Phoebus et umbras
extendat Meroe. quis causas reddere possit?
sic iussit natura parens discurrere Nilum,
sic opus est mundo. (10.230-9)

Ordered to give balance to the harsh climate, it comes forth in the middle of the heat beneath the scorching zone, and in order that fire not destroy the lands, the Nile comes to the aid of the world and swells against the burning mouth of the Lion, and when Cancer burns its own Syene, he is called upon and comes to give aid, and he does not free the fields from his waves until Phoebus slopes towards autumn and Meroe lengthens its shadows. Who could give the causes? In this way has mother nature ordered the Nile to run back and forth, in this way is the world able to work.

Although Acoreus' emphasis on the beneficent and necessary service that the Nile provides for Egypt is commonplace,¹⁰⁷ the priest does not simply assert that the Nile helps Egypt and the Egyptians. Instead, Acoreus adopts a universalizing perspective: the Nile brings balance when the heavens are harsh (*dare iussus iniquo* | *temperiem caelo*), comes to the assistance of the

¹⁰⁶ Cf. Diod. Sic. 1.10.3, where Diodorus reports an Egyptian narrative that connects Egypt as a whole, rather than the Nile in particular, with the origins of the cosmos: εἶναι φανερόν ὅτι κατὰ τὴν ἐξ ἀρχῆς τοῦ κόσμου σύστασιν τῆς γῆς εὐκράτου καθεστῶσης μάλιστ' ἂν ἔσχε τὴν γένεσιν τῶν ἀνθρώπων ἢ κατ' Αἴγυπτον χώρα.

¹⁰⁷ See, e.g., Herod. 2.13-4, Diod. Sic. 1.36, Sen. *NQ.* 4a 2.1-2, Pomp. Mela 1.49, and Plut. *De Iside et Osiride* 366a-b.

entire world in order to keep fire from destroying the earth (*neu terras dissipet ignis* | *Nilus adest mundo*), and thereby allows the world as a whole to function or operate smoothly (*sic opus est mundo*).¹⁰⁸ Acoreus, then, sings about an elemental battle between fire and water in which the Nile actively fights against the forces of heat and dryness and so preserves the *mundus* from devastation.¹⁰⁹ Acoreus' scenario is not entirely unique, and Plato's *Timaeus* provides a particularly instructive parallel. There, Kritias reports a conversation between Solon and an anonymous Egyptian priest during which Solon inquires about the distant past and the priest explains the periodic destruction of human life through either all-consuming conflagration or catastrophic flood. But the priest expressly notes that the Nile assists Egypt in times of conflagration: "The Nile, which is our savior in other circumstances, saves us from this difficulty at that time too by unleashing itself" (ἡμῖν δὲ ὁ Νεῖλος εἰς τε τᾶλλα σωτὴρ καὶ τότε ἐκ ταύτης τῆς ἀπορίας σώζει λυόμενος, *Tim.* 22d 5-6). The Nile's inundation protects Egypt and the Egyptians from the fire and makes possible the regeneration of mankind. Acoreus, himself an Egyptian priest, adopts the persona of Plato's anonymous Egyptian priest, and his universalizing language extends the role of the Nile to the cosmic level, suggesting that the Nile's flood combats a truly primordial fire and so saves the world as a whole. Acoreus' song describes a cosmological battle and the near destruction, and hence the implicit regeneration, of the *mundus*.¹¹⁰

¹⁰⁸ In 239, I take *mundo* as a possessive dative (lit. "in this way the world has work, activity, functioning").

¹⁰⁹ Cf. Berti 2000: 194, who describes the situation as "una sorta di scontro cosmico fra terra e cielo e fra i due elementi dell'acqua e del fuoco" and suggests, apropos of *imploratus adest*, that the Nile's flood resembles a divine epiphany.

¹¹⁰ A partial parallel for Acoreus' imagery comes from Stoicism. As Hahn 1977: 57-8, 185-6 observes, certain Stoics imagine that when the fire of ἐκπύρωσις is finally extinguished, it gives

Acoreus' knowledge and subject matter, then, connect him with paradigmatic didactic figures, such as Orpheus and Silenus, who sing about the origins of the world and the nature of things in general. From this perspective, Homer's Demodocus offers another important parallel. Ancient critics regularly interpret Demodocus' song about Ares and Aphrodite (*Od.* 8.266-366) as an allegorical account of creation, attributing to Demodocus—or, rather, to Homer—Empedoclean philosophical principles.¹¹¹ Acoreus assumes the role of one of these Ur-poets who sings about the Ur-themes of natural philosophy, and it is precisely this spectacular identity that endows him with an unexpectedly potent voice and grants him a unique purchase from which to address and mesmerize Caesar. Moreover, since the Nile does not figure in such didactic miniatures and no other didactic poems on the Nile are known, Acoreus' song represents a radical innovation. This sense of novelty further allows him to outdo his literary predecessors and to captivate an inquisitive addressee who has no time for the mundane songs of the Aratean

way to a state of water. Although this watery state does not combat the fire of ἐκπύρωσις, but simply follows that fire, it does make possible the creation of a new world order and the regeneration of life (see, e.g., Sen. *NQ.* 3.13). Plutarch's *De Iside et Osiride* provides another set of partial parallels. There, Plutarch reports various allegorical interpretations of the Isis and Osiris saga, some of which recast the mythological story in natural philosophical terms. Note, in particular, 364a: “the wiser priests do not only call the Nile ‘Osiris’ nor the sea ‘Typhon’, but [they call] ‘Osiris’ the entire principle and power that produces moisture, thinking him the cause of generation and the substance of seed, and [they call] ‘Typhon’ all that is dry and fiery and that causes dryness in general and that is an enemy of moisture” (οἱ δὲ σοφώτεροι τῶν ἱερέων οὐ μόνον τὸν Νεῖλον Ὅσιριν καλοῦσιν οὐδὲ Τυφῶνα τὴν θάλατταν, ἀλλ’ Ὅσιριν μὲν ἀπλῶς ἅπασαν τὴν ὑγροποιὸν ἀρχὴν καὶ δύναμιν, αἰτίαν γενέσεως καὶ σπέρματος οὐσίαν νομίζοντες· Τυφῶνα δὲ πᾶν τὸ ἀχμηρὸν καὶ πυρῶδες καὶ ξηραντικὸν ὄλως καὶ πολέμιον τῇ ὑγρότητι). Although this kind of narrative envisions an explicitly universal conflict between water and heat, it does not cast the Nile itself as a combatant in that conflict, but rather focuses on the elemental identities of mythological figures. Cf. Diod. Sic. 1.10, where Diodorus reports Egyptian narratives according to which human, as well as animal, life originated in Egypt due to the area's climatic balance and the fruitful nature of the Nile.

¹¹¹ Heracl. *All.* 69 and Ps.-Plut. *De Hom.* 100-1. For the ancient tendency to treat Homer as the origin of virtually every branch of learning and even particular philosophical doctrines, see Lausberg 1990: 185-7 and, in particular, Hillgruber 1994: 1.5-35.

tradition.¹¹² But even though Acoreus appropriates this poetic identity, he is also a foreigner, an Egyptian, and so stands outside of this Homeric or Virgilian tradition. Unconstrained by the norms of Greco-Roman natural philosophical poetry, Lucan's Egyptian priest is free to manipulate the conventions of that poetry, and this is exactly what he does. In contrast to figures such as Orpheus and Silenus, who sing simple straightforward songs that teach instructive lessons, Acoreus adopts a subtly combative stance towards his interlocutor and repeatedly challenges his authority. Egypt and the Nile displace Rome as the center of the universe, and Roman Caesar seems unable to fight back.

The priest's initial response to Caesar's inquiry begins to make this clear. Here, Acoreus construes himself as a religious initiate or *mustēs*, and this characterization has important implications for how we understand Acoreus' didactic persona:¹¹³

fas mihi magnorum, Caesar, secreta parentum
 edere ad hoc aevi populis ignota profanis.
 sit pietas aliis miracula tanta silere;
 ast ego caelicolis gratum reor ire per omnis
 hoc opus et sacras populis notescere leges. (10.194-8)

It is right for me, Caesar, to pronounce the secrets of my great ancestors, unknown up to this point in time to profane peoples. Let it be piety for others to keep silent about wonders that are so great; but I think it pleasing to the heaven-dwellers that this work spread among all peoples and that the sacred laws become known to them.

Acoreus emphatically contrasts himself with the uninitiated and promises to make a solemn disclosure of secret ancestral knowledge.¹¹⁴ That others consider it a religious duty to keep silent about such wondrous information implies that this knowledge is cultic and can be disclosed only

¹¹² Although Lucretius does discuss the Nile briefly at *DRN* 6.712-37, there is no evidence of any extended poetic treatments of the river.

¹¹³ Barrenechea 2010: 269-80 discusses Acoreus' religious status in more detail but does not explicitly connect it with ritual initiation or didactic poetry.

¹¹⁴ For *edere*, "to utter solemnly, pronounce (an oracle, etc.)", see *OLD* s.v. 6b.

to select individuals. This is the language of the mysteries. In fact, Acoreus later asserts that he will reveal (*prodam*, 10.285) the source of the Nile insofar as god himself has granted him understanding of the river (10.285-7),¹¹⁵ and Lucan even tells us that Acoreus wears linen clothing (*linigerum... Acorea*, 10.175), thereby suggesting an association with Isis and her cult.¹¹⁶ It seems that Acoreus will disclose his sacred or divinely inspired knowledge and so perform a kind of initiation, and the reader may expect the following song to explain the secret connections between the Nile and the mythology of Isis and Osiris.¹¹⁷ Two basic points need to be made. On the one hand, the language of revelation and initiation further characterizes Acoreus as a poet of cosmological didactic. Such poets regularly present themselves, or are presented by others, as *mustai* who reveal sacred knowledge and thereby initiate their addressees into the intellectual mysteries of their own areas of expertise.¹¹⁸ Lucretius, for instance, invokes the imagery of revelation and initiation when he declares to Memmius: “I will begin to tell you about the highest system of the sky and the gods, and I will reveal the beginnings of things” (*tibi de summa caeli ratione deumque | disserere incipiam et rerum primordia pandam*, 1.54-5).¹¹⁹

¹¹⁵ Cf. Barrenechea 2010: 270.

¹¹⁶ For the implications of *liniger*, see Berti 2000: 164 and *OLD* s.v. Cf. Plut. *De Iside et Osiride* 352c-f.

¹¹⁷ Plutarch’s *De Iside et Osiride* treats the connections at length (note especially 363d-368f).

¹¹⁸ Fowler 2000, focusing mainly on Lucretius, discusses intellectual or philosophical initiation as a “didactic plot”, whereby the poet leads his addressee “through darkness and fear to light and a vision of the truth” (p. 213), and notes that such imagery appears already in the poems of Parmenides and Empedocles (p. 214). It is significant that poetic composition and study can also be connected with ritual initiation. For instance, various writers configure Homer as one who reveals sacred knowledge (thus Lucr. 1.124-6 and Heracl. *All.* 76.1), or treat the actual interpretation of the Homeric poems as the revelation of such knowledge (thus Heracl. *All.* 64.4).

¹¹⁹ Fowler 2000: 213-5 discusses several other relevant Lucretian passages, especially the prologue to *DRN* 3. Cf. *DRN* 1.124-6, 144-5 and 5.52-4.

Ovid's Pythagoras performs a similar maneuver when he boasts of divine inspiration and then promises to reveal or unlock secret knowledge (*Delphosque meos ipsumque recludam | aethera et augustae reserabo oracula mentis*, 15.144-5),¹²⁰ and Manilius frequently presents the *mundus*, *natura*, or even god as revealing their own mysteries and subsequently charging the astrological poet with the task of communicating those mysteries to others.¹²¹ As a didactic poet who promises to disclose the unknown secrets of the divine, Lucan's Egyptian priest belongs to this literary tradition.

On the other hand, Acoreus takes this generic topos to a paradoxical extreme that suggests that he is exploiting the conventions of cosmological didactic and that we should read his remarks with a high degree of skepticism. When figures such as Lucretius use the language of revelation and initiation, they address themselves to one particular interlocutor, with whom they stand in a privileged relationship, and avoid making blatantly self-contradictory claims about their behavior. But even though he addresses Caesar, Acoreus promises to impart his learning to all uninitiated peoples and emphatically turns the moral language of Roman religion upside down. Despite the topos upon which the priest relies, it is simply not *fas* to reveal the secrets of the mysteries to *populi profani*, and it is comically absurd to suppose that *pietas* sanctions or even demands such a disclosure.¹²² Although it is possible to take Acoreus at his

¹²⁰ Myers 1994: 142-4 well discusses the irony of this passage vis-à-vis Lucretius. For the implications of *recludere* and *reserare*, see Skutsch 1985: 375 on Ennius *Ann.* 210. Cf. Heracl. *All.* 76.1, where Homer is said to have opened up the untrodden and closed-off paths to the sky.

¹²¹ See, e.g., 1.11-12, 40-50, 4.915-21.

¹²² One would have expected Acoreus to say that such a disclosure is *nefas*. Manilius worries about this problem but circumvents it by claiming that either the universe, nature, or god actively reveals itself, thereby rendering it permissible to divulge the knowledge in question (note *ipse vocat nostros animos ad sidera mundus | nec patitur, quia non condit, sua iura latere. | quis*

word, I suggest that this profession is deliberately tongue-in-cheek and so constitutes the first of several challenges to Caesar's authority. When he asks to learn about the Nile, the general adds that he will give up civil war altogether if Acoreus gives him a sure hope of seeing the river's source (*spes sit mihi certa videndi | Niliacos fontes, bellum civile relinquam*, 10. 191-2). Given Caesar's personality, it is difficult to take this promise seriously, and Acoreus' hyperbolic response implies that he himself does not—Caesar facetiously promises to put an end to civil strife, and Acoreus sarcastically offers to reveal the mysteries of the river.¹²³ Other elements in Acoreus' didactic song support this reading, and a similarly combative stance can be seen quite clearly in the priest's description of an elemental battle between fire and the Nile. Elsewhere in the poem, Caesar possesses a fiery and destructive nature. When he famously describes Caesar as a devastating thunderbolt, Lucan emphasizes its flame and fires (*flamma* at 1.154 and *ignes* at 1.157), and the general later likens himself to a great fire that feeds on and gains strength from everything in its way (*utque perit magnus nullis obstantibus ignis | sic hostes mihi desse nocet*, 3.364-5). But at certain points in the poem, Caesar's *flamma* and *ignes* come into direct conflict with various forms of water, such as the flood in Book 4 and the storm at sea in Book 5.¹²⁴ Acoreus' description of an elemental battle in which water successfully combats fire, thereby

putet esse nefas nosci, quod cernere fas est? 4.920-2). In Greek, it is οὐ θέμις or οὐ θεμιτόν to disclose the secrets of the mysteries; see Dover 1968: 112 on Arist. *Clouds* 140.

¹²³ Egyptian priests are notoriously reluctant to share their religious secrets with the general population (see, e.g., Diod. Sic. 1.21.1, 27.6, and Plut. *De Iside et Osiride* 352b, 354b-c, 382e).

¹²⁴ See Schönberger 1960, Rosner-Siegel 1983, and Loupiac 1998. Ahl 1976: 224 and Roche 2009: 192-3 compare the thunderbolt simile to Lucan's account of Caesar's visit to Alexander's tomb (10.20-52). There, Alexander overcomes various rivers (32-3), is a deadly thunderbolt and harmful star (34-6), and could have drunk from the Nile's source (40). Since numerous scholars (e.g., Morford 1967a: 13-9, Ahl 1976: 223-5, Rossi 2005) have pointed to connections between Lucan's Caesar and Alexander, we may note that Alexander's characterization at the start of Book 10 prefigures the implications of Acoreus' imagery in the middle of Book 10.

restoring balance to the natural world, suggestively constitutes a challenge to Caesar's pretensions. Unlike Achilles, who literally wages war on the Scamander and triumphs with the help of Hephaestus' fire (*Il.* 21.211-382), Acoreus suggests that a fiery and all-consuming Caesar will lose his battle with a river and therefore remain ignorant of the causes of its summer flood and the location of its source.¹²⁵ At the same time, it is significant that Caesar does not actually fight the Nile. Rather, he fights Acoreus, and it is Acoreus, not the Nile, who will ultimately reveal or fail to reveal the knowledge that Caesar wants. By bringing war to Egypt, the general endeavors to discover the river's secrets by brute force. As a foreign combatant, Acoreus attempts to thwart this plan, slowing the general down by promising—disingenuously, as we will see—to reveal the sacred knowledge of the mysteries through the inspired medium of didactic poetry. Caesar listens in rapt attention for over 130 lines while the Egyptian forces regroup and Pothinus plots his assassination, but the secrets of Acoreus' ancestors remain forever hidden and no initiation takes place.

Before considering the ways in which this didactic poet avoids fulfilling his initial promise, we need to consider another constellation of ideas that informs both Caesar's request and Acoreus' response. Ancient scientists were notoriously unable to agree on the causes of the Nile's flood, and nobody in antiquity was able to discover its source.¹²⁶ Diodorus Siculus, for

¹²⁵ Green 1991: 234-43 well compares Lucan's Caesar and Achilles. With this in mind, Caesar's battle with the Nile stands in stark contrast to his actual encounter with the Scamander. While touring Troy at the end of Book 9, the Roman Achilles receives no resistance whatsoever and crosses the once mighty river completely unawares (*in scius in sicco serpentem pulvere rivum | transierat, qui Xanthus erat*, 9.975-6). Caesar's battle with the Nile in Book 10 also contrasts markedly with his encounter with the Rubicon in Book 1. Despite the cataclysmic results, the general crosses that river effortlessly (*Caesar, ut adversam superato gurgite ripam | attigit, Hesperiae vetitis et constitit arvis*, 1.223-4). Cf. Walde 2007: 30.

¹²⁶ For the Nile in Roman literature in particular, see Postl 1970. According to one tradition, Aristotle sent Alexander to discover the cause of the Nile's summer flood and Alexander did just

instance, characterizes the Nile's summer flood as something about which all people make inquiries (τὸ παρὰ πᾶσιν ἐπιζητούμενον, 1.37.1), but emphasizes that it is possible to argue against all those who attempt to explain it (δυνάμενοι [sc. ἡμεῖς] ποικιλώτερον ἀντειπεῖν πρὸς ἅπαντας, 1.41.10). He also declares that nobody has ever seen the river's source or received secondhand information from anybody who has (1.32.1 and 37.6), and describes the question as a matter of guesswork and plausible conjecture (τοῦ πράγματος εἰς ὑπόνοιαν καὶ καταστοχασμὸν πιθανὸν καταντῶντος, 1.37.7). Seneca appears to have been of the same opinion. In a passage from the *De mensibus* based on portions of Seneca's *Natural Questions* that are now lost, John the Lydian represents the problem of the Nile's source as a matter of mere speculation with no truth to be had at all (ποικίλαι μὲν οὖν αἱ περὶ αὐτοῦ δόξαι, τὸ δ' ἀληθές κατὰ τοὺς ἀνθρώπους τῶς οὐδαμοῦ, Sen. *NQ.* 4a 420-1 Hine). The obscurity of the Nile's source even constitutes a learned poetic topos. Callimachus has the Nile himself boast that, despite his size, no mortal man knows where he begins his journey (fr. 384.31-2 Pf.), Tibullus wonders why and where the Nile concealed his source (1.7.23-4), Horace announces that the river deliberately keeps its origins secret (*Carm.* 4.14.45-6), and Ovid explains that, when Phaethon set the world on fire, the Nile fled and hid its head, which still lies hidden even now (*Met.* 2.254-5). Moreover, despite their reputation for philosophical and scientific erudition, Egyptian priests are traditionally unreliable sources of information about the Nile. Thus Herodotus emphatically declares that he was unable to learn anything about the Nile's summer flood from the priests he interviewed (2.19), and later states that nobody was able to inform him about the Nile's origins except for one particular priest who appeared to him to be playing or even joking (οὗτος δ' ἔμοιγε παίζειν ἐδόκεε φάμενος εἰδέναι ἀτρεκέως, 2.28). Diodorus Siculus also singles out the

that, locating the river's source as well (Arist. fr. 246 Rose). Acoreus (10.272-5) and Lucan himself (10.40) conspicuously reject this tradition.

Egyptian priests for censure, ridiculing their theory that Ocean constitutes the river's ultimate origin (1.37.7), and later criticizes the theories of the philosophers from Memphis (1.40), the very city from which Acoreus hails (*hunc [sc. Acorea] genuit... Memphis*, 8.477-8). From this perspective, the Nile represents the boundary or limit of scientific inquiry. Caesar poses two paradigmatically unanswerable questions to an individual from whom he should not expect a reliable answer, and Acoreus gives a performance that constitutes both a paradox and a game. His long complicated song ironically purports to answer the unanswerable and, in the end, he himself adopts the role of Herodotus' playful priest. It is from this perspective that Acoreus will counter Caesar's attack with his own brand of scientific poetry.¹²⁷

The most basic way in which Acoreus begins to employ the didactic tradition as an instrument of war is by simply refusing to answer Caesar's questions. Acoreus' song does not convey the information that it claims to convey.¹²⁸ Acoreus' discussion of the planets identifies the time of year when the flood begins and ends, but does not provide a reason for the fact that the river floods during the summer (10.199-218).¹²⁹ Nor does the subsequent discussion provide

¹²⁷ In the *Trojan Discourse* (= *Or.* 11), Dio Chrysostom manipulates Herodotus' playful priest in a similar way. From 11.37-70, Dio reports the speech of an aged Egyptian priest who allegedly informed him of the "true" causes of the Trojan War. The priest, who disdains Greek intellectual history and literature, gives an account of the war that repeatedly and ostentatiously contradicts the Homeric tradition and so tests the reader's knowledge and acuity, just like the *Trojan Discourse* itself. The nature of the game is clear from the outset when the priest ridicules the Greeks en masse for having been tricked by merely one man (11.37), ostensibly Homer but, by implication, potentially the priest and Dio himself.

¹²⁸ Barrenechea 2010: 276-8 argues that Acoreus refuses to answer only Caesar's second question.

¹²⁹ Beajeu 1979: 215-6 and Barrenechea 2010: 276 wrongly identify Mars as the cause of the flood. Berti 2000: 181 sees that the passage identifies the date at which the flood begins. The key lines are: *quae [sc. ora, i.e., fontes] cum dominus percussit aquarum | igne superiecto, tunc Nilus fonte soluto... iussus adest, auctusque suos non ante coartat | quam nox aestivas a sole receperit horas* ("when the lord of the waters [i.e., Mars] strikes [the source of the river] with his

any concrete explanation for this peculiarity. Although he does attribute the flood to the providential outlook of nature, Acoreus qualifies this assertion, rhetorically wondering who could account for its causes (*quis causas reddere possit? | sic iussit natura parens discurrere Nilum*, 10.237-8). This juxtaposition implies that a theory based on divine machinery, or an ill-defined *natura*, does not count as a rigorous scientific analysis of natural philosophical *causae*. As we have already seen, Acoreus' only other positive statement on the matter connects the Nile with the origins of the current cosmic *conpages* and places a Stoicizing *deus* in control of the river's behavior (*ast ego... quasdam [sc. aquas] conpage sub ipsa | cum toto coepisse reor, quas ille creator | atque opifex rerum certo sub iure coercet*, 10.262-7).¹³⁰ Once again, Acoreus has recourse to the divine rather than the scientific. The poet's account of the Nile's summer flood conspicuously fails to *causas reddere*. The same can be said of Acoreus' treatment of the Nile's source. Here, Acoreus makes only vague and imprecise statements. Addressing the river itself, he declares *medio consurgis ab axe* ("you rise from the middle zone", 10.287) and *solique vagari | concessum per utrosque polos* ("to you alone it is granted to wander through both hemispheres", 10.300-1). Although certain authorities locate the river's source in the southern hemisphere or associate it with the Antipodes, Acoreus gives no details and makes no

fire directly overhead, then the Nile's source is loosed and it comes to the aid as ordered, and it does not check its growth until night takes back the summer hours from the sun", 10.214-8). The *cum* clause and ablative absolute identify the date at which the flood begins by describing the position of Mars relative to the Nile's source at that time. *Tunc* confirms this. The remainder of the sentence follows a parallel structure, where *antequam* identifies the date at which the flood begins to recede by describing the behavior of the moon and sun at that time. Cf. Pomp. Mela 1.52 *non pererrat [sc. Nilus] autem tantum eam [sc. terram] sed, aestivo sidere exundens, etiam irrigat*, where the ablative absolute *aestivo sidere* is clearly temporal in force.

¹³⁰ Although Acoreus does make the positive assertion that certain heavenly bodies feed on Ocean (*nec non Oceano pasci Phoebumque polosque | credimus*, 10.258-9), this assertion does not imply his assent to the theory that follows.

arguments.¹³¹ The following narrative traces the course of the river from Meroe to Memphis, but does not offer any more precise information about the location of its source. But it is important to note that, just as he draws attention to the impossibility of explaining the Nile's summer flood, Acoreus emphatically highlights the fact it is impossible to locate the river's source:

arcanum natura caput non prodidit ulli,
nec licuit populis parvum te, Nile, videre,
amovitque sinus et gentes maluit ortus
mirari quam nosse tuos. (10.295-8)

Nature has not revealed your hidden head to anyone, Nile, nor have peoples been allowed to see you when you are small, and she removed your curves and preferred races to wonder at your origins rather than to know them.

Two points need to be made. First, as we have already seen, one of the goals of the didactic poet is to uncover that which lies hidden. In his *recusatio* to cosmological didactic, Lucan refuses to undertake this task and orders the unknown *causa* of the tides of the Gallic coast to “lie hidden, as the gods above have wished” (*ut superi voluere, late*, 1.419). Here, Acoreus claims that *natura* desires to conceal the origins of the Nile.¹³² Despite his initial promise to reveal the knowledge of his ancestors and so to disclose the mysteries of his cult to the *profani*, Acoreus complies with the wishes of nature and, implicitly, the gods. Second, the opposition between wonder (*mirari*) and knowledge (*nosse*) figures regularly in didactic texts, particularly in the *DRN*, and another key goal of the scientific or didactic poet, especially Lucretius, is to replace wonder with knowledge. Acoreus does just the opposite. Initially, the poet implies that he considers it an act of impiety to keep silent about such things (*sit pietas aliis miracula tanta silere; | ast ego...*, 10.196-7). The song that follows, however, does not explain the Nile's

¹³¹ Romm 1992: 150-1, who cites Eudoxus fr. 287-9 Lasserre and Pomp. Mela 1.53-4. Cf. Diod. Sic. 1.41.4-9, Pomp. Mela 3.96-7, Aelius Aristides 48.339, and Sch. ad Ap. Rhod. 4.269-71a.

¹³² Cf. 10.271, where Acoreus claims that the river's “natural ability to lie hidden still triumphs” over the desire of tyrants to expose it (*vincit adhuc natura latendi*).

miracula and does not lead to the knowledge that Caesar requests. Just as nature herself prefers *mirari* to *nosse*, so too Acoreus prefers to force his audience to wonder at, but never to know or understand, the secrets of the Nile. From both of these perspectives, Acoreus' song constitutes a didactic paradox. It is a didactic poem that is both a *recusatio* to didactic and an inversion of the values of didactic. As we will see, Acoreus transforms didactic and reinvents its purpose. In the service of war, the priest actively shuts down the possibility of scientific inquiry and tests his audience's knowledge with distortions and misinformation.

Instead of offering positive explanations of the Nile's peculiar nature, Acoreus consistently closes off possible avenues of exploration and short-circuits the process of scientific investigation. The second half of Acoreus' song does this rather unobtrusively.¹³³ In following the Nile's course from Meroe, between the 6th and 5th cataracts, down to Memphis, just below the Delta, Acoreus moves from the edges of the familiar to the confines of the well-known. Since the narrative begins in the middle of the river's course, the audience has no chance to survey other more distant areas where its source must naturally lie. Herodotus, by way of contrast, begins at Elephantine, just north of the 1st cataract, and then heads into the unknown, moving south and eventually west with great precision and in copious detail (2.28-34). Unlike Herodotus, Acoreus renders it impossible to find the source of the Nile.

In the first half of his song, Acoreus acts more aggressively. Here, he presents six scientific theories that claim to account for the Nile's summer flood. With one exception, all of these theories can be traced to certain Greek sources.¹³⁴

¹³³ Cf. Barrenechea 2010: 277-8.

¹³⁴ Theories A, C, D, and E all appear in Sen. *NQ.* 4a 2, who also starts with theory A. Although theory B does not figure in the extant portion of the book, John the Lydian, drawing directly on Seneca's discussion, cites it, and it seems more than likely that it will have appeared in the

- A) 219-27 Anaxagoras' theory that melting snows in Ethiopia cause the river to swell.
- B) 239-43 Either Democritus' or Thrasyalces of Thasos' theory that, during the summer, Zephyrs blowing from the west cause rains to settle over the river.
- C) 244-7 Thales' theory that, during the summer, Zephyrs blowing counter to the river's current force it back upon itself.
- D) 247-54 Diogenes of Apollonia's theory that the intense sun and parched earth of mid-summer attract subterranean waters that augment the river's flow.
- E) 255-7 Either Democritus' or Euthymenes of Massilia's theory that excess water from Ocean causes the river to swell.
- F) 258-61 An anonymous theory that the sun, which feeds on the earth's waters, draws up more liquid than it can contain during the height of summer and the excess moisture then augments the river.

The names associated with Acoreus' collection of theories belong to some of the oldest and most prestigious figures of the Greek scientific tradition, including Thales, Anaxagoras, and Democritus, and a number of these theories play prominent roles in the works of other high-profile authors, such as Herodotus and Lucretius.¹³⁵ Acoreus' list thereby establishes his intimate familiarity with Greco-Roman intellectual history. It implicitly sets him on a par with

original treatise. For the identity of the proponents of the individual theories, see Berti 2000 ad loc., and cf. Seneca's corresponding discussions with the notes of Vottero 1989.

¹³⁵ In addition to a variety of other theories, Herod. 2.19-25 mentions theories A, C, and E, while Lucr. 6.712-37 mentions theories A, B, and C. Although theory F cannot be connected with a specific authority, it clearly draws on Stoic ideas about the nourishment of the heavenly bodies; see Berti 2000: 207-8.

writers of high scientific caliber and characterizes him as fully qualified to conduct the present inquiry. The actual discussion, however, subtly belies this impression. In order to see this, it is essential to look at how the individual theories actually enter the text. Acoreus introduces theory A as *vana fides veterum* (“the hollow belief of the ancients”, 10.219) and rejects it on the grounds that the mountains of Ethiopia have no north winds. As proof (*testis*, 10.221), he cites the color of the area’s inhabitants and the warmth of the south winds. He also argues that melting snow regularly causes other rivers to flood at the very beginning of spring, whereas the Nile overflows its banks between the summer solstice and the autumnal equinox. Clearly, this theory cannot be accepted. Acoreus’ initial disdain belittles the Greco-Roman natural scientific tradition, and the subsequent barrage of evidence and argumentation immediately establishes his scientific authority. Both maneuvers encourage the audience to trust Acoreus and to submit to his conclusions. This is a situation that the priest exploits. As Acoreus continues, his accounts become increasingly curt and dismissive. Theory A receives 9 lines, theories B and C together receive another 9, theory D only 8, and theories E and F a mere 3 and 4, respectively. At the same time, Acoreus adduces no evidence and constructs no arguments to counter any of these theories, even though he continues to denigrate the Greek intellectual tradition as a whole, dismissing theories B and C as the product of *vana vetustas* (“hollow antiquity”, 10.239) and characterizing theory E as mere *rumor* (10.255). Acoreus simply refuses to take this tradition seriously and to waste his time putting forward detailed refutations. He implies that what he does to theory A, he can do to theories B-F. This procedure needs to be read against Lucan’s own method of scientific inquiry. We have already seen that Lucan regularly piles up alternative explanations for certain natural phenomena and refrains from passing judgment. Acoreus adopts

the exact opposite procedure. Whereas Lucan creates an air of openness and possibility, Acoreus shuts down any chance of discovery or truth, and Caesar says absolutely nothing.¹³⁶

Acoreus also packs his discourse with irrelevant or misleading information designed to test his audience. The initial account of the planets makes this clear. Although this discussion establishes a cosmic or universalizing framework for the song to follow and eventually identifies the time of year when the river floods, the first 11 lines have nothing to do with the topic at hand and include a number of arbitrary assertions (10.199-209). Acoreus, for example, informs Caesar that the sun's rays cause the stationary position or retrograde motion of the other planets (10.202-3), although this information leads nowhere.¹³⁷ In order to understand Acoreus' method, we need to consider Caesar's request. Caesar's opening remarks aggressively attempt to establish his own intellectual credentials. Initially, Caesar asks Acoreus to tell him about the history, geography, customs, and religion of the Egyptians (*Phariae primordia gentis | terrarumque situs volgique edissere mores | et ritus formasque deum*, 10.177-9). These four topics constitute the major themes of the ethnographic tradition, with which Caesar, as the author of an ethnographic treatise himself, implicitly claims to be familiar.¹³⁸ Caesar also suggests his

¹³⁶ Note that Acoreus manifests his disdain for Caesar, as opposed to the Greek intellectual tradition, when he simply stops addressing him. Beginning at 10.287, Acoreus addresses the Nile in the vocative and repeatedly speaks of it in the second person singular, effectively shutting Caesar out of the conversation and stripping him of his status as an actively engaged didactic student or addressee.

¹³⁷ This is the so-called radio-solar theory of planetary motion; it is astrological and does not belong to the tradition of Hellenistic mathematical astronomy. See Beaujeu 1979: 215 + n.5 and Volk 2009: 51-2. Hannah 1996: 183 observes that "to stand still, or worse, to go back in retrogradation, was a poor sign for a planet". By conspicuously mentioning such negative states of rest and backward movement, Acoreus may be pointing to Caesar's current lack of forward progress.

¹³⁸ Various critics see a possible allusion here to the title of Seneca's lost *De situ et sacris Aegyptiorum*; see Lausberg 1989: 1934 + nn.198-200. Lausberg 1989: 1935, 1990: 183, Berti

awareness of hieroglyphics, parades his supposed knowledge of Plato's visit to Egypt, and boasts of his astronomical erudition (10.179-87). In response to Caesar's grandstanding, Acoreus begins his account of the Nile's flood by putting on display his own astronomical and astrological savvy. This lesson, as we have already seen, contains a number of peculiarities. In addition, Acoreus lists the seven planets in the following order: sun, moon, Saturn, Mars, Jupiter, Venus, Mercury. This sequence is highly unusual and tests Caesar's knowledge of the heavenly bodies. Achilles Tatius, for instance, lists five ways in which certain scientists order the planets (*Isag.* 16 pp. 42-3 Maass), and none of them corresponds with Acoreus' sequence. Caesar, of course, says nothing.¹³⁹ Acoreus assigns peculiar powers to some of the planets as well, stating that Mars controls the winds and lightning, and associating Mercury with water. Other astrological texts make no such claims.¹⁴⁰ Acoreus also presents as a simple fact the idea that the moon is responsible for the tides. Elsewhere in the poem, Lucan himself calls this idea into question.¹⁴¹ When he actually attempts to identify the date at which the Nile begins to flood, Acoreus again refuses to give a straightforward account (10.210-18). Despite possible textual corruption, Acoreus produces a jumble of information that confuses the summer solstice, when the sun crosses the solstitial colure and passes from Gemini into Cancer, and a later date, when

2000: 161, Schrijvers 2005: 33-4, and Barrenechea 2010: 269 n.38 also suggest a parallel with the request of Ovid's Perseus, made after a banquet, that Cepheus relate *cultusque genusque locorum... moresque animumque virorum* (*Met.* 4.766-7). Barrenechea 2010: 269 + n. 39 argues that these topics belong to the tradition of Roman epic as well.

¹³⁹ Apropos of Nigidius Figulus, Hannah 1996: 179 + nn. 14-5 notes that the most common order of the planets before 150 CE is: sun, moon, Saturn, Jupiter, Mars, Venus, Mercury.

¹⁴⁰ See Housman 1926 ad loc.

¹⁴¹ For Lucan's reluctance to assign a cause to the tides, see 1.409-19, although, as Roche 2009: 286 notes, at 6.479 Lucan does in fact assert that the moon causes the tides.

Sirius experiences its matutinal rising and the sun passes from Cancer into Leo.¹⁴² Acoreus, then, creates a web of confusion and disorder that is perhaps designed to challenge Caesar's self-proclaimed knowledge. Astronomical and astrological learning, which appear entirely trustworthy and enjoy a privileged epistemological status elsewhere in the poem, suddenly become problematic. Acoreus' discussion of the planets suggests the didactic poet's ability to manipulate scientific knowledge, and simultaneously defies Caesar to untangle fact from fiction.

Acoreus, then, sings a paradoxical didactic song that says nothing and goes nowhere. This situation clearly distinguishes him from the other representatives of the didactic tradition who figure in the *Bellum Civile*. Unlike representatives of the Aratean tradition or poets such as Nicander and Virgil, Acoreus foregoes trivial questions of everyday life and shows no interest in giving practical advice about the real world. After the spectacular failure of this kind of didactic in Book 9, Acoreus offers something different and rather more insidious, an act of war. In fact, while Acoreus serenades his audience, his song allows Pothinus time to plot an attack:

sic velut in tuta securi pace trahebant
noctis iter mediae. sed non vaesana Pothini
mens inbuta semel sacra iam caede vacabat
a scelerum motu... (10.332-5)

Thus, as if free from care in safe peace, they dragged out the course of middle night. But the mad mind of Pothinus, now that it had once been intoxicated with sacred slaughter, was not free from the instigation of crimes...

Although Acoreus and Caesar play the roles of didactic poet and didactic addressee *velut in tuta securi pace*, they are actually military combatants in an ongoing conflict, and Acoreus' song serves a very real purpose. This situation needs to be read against the tradition of didactic poetry. It is a topos of Latin didactic that war and didactic poetry cannot coexist. At the beginning of the *DRN*, Lucretius addresses Venus at length and prays for peace: "For we are not

¹⁴² Housman 1926: 334-7.

able to go about our task with a calm mind at a time unfavorable for our country, nor can the distinguished offspring of Memmius fail the communal safety amidst such circumstances” (*nam neque nos agere hoc patriai tempore iniquo | possumus aequo animo nec Memmi clara propago | talibus in rebus communi desse saluti*, 1.41-3). Lucretius requires an end to fighting so that he may write his didactic poem and his addressee may have the free time to read it. A similar problem plagues the *Georgics*, where the brutality of war is omnipresent. At the end of Book 1, for instance, the poet laments that “the plow does not have the esteem of which it is worthy, the fields lie fallow since the farmers have been taken away, and the sickles are melted down into hard swords” (*non ullus aratro | dignus honos, squalent abductis arva colonis, | et curvae rigidum falces conflantur in ensem*, 1.506-8). Fighting continually threatens to consume the landscape and livelihood of the farmers for whom Virgil ostensibly writes, thereby rendering null and void the entire didactic enterprise. By the time Manilius and Germanicus write their didactic poems, however, the situation has improved. Nevertheless, both authors stress the importance of peace for their undertakings. Although he declares that the universe itself wishes him to investigate it and to compose astrological *carmina*, Manilius notes that *hoc sub pace vacat tantum* (“there is leisure for this only during peacetime”, 1.13, cf. 1.922-6). Germanicus is more emphatic. He doubts whether the signs would have any potency at all *si non parta quies... puppibus aequor | cultorique daret terras, procul arma silerent* (“if tranquility had not been produced... and did not entrust the sea to ships and the lands to the farmer, if arms were not silent and far way”, 9-10), admits that only under such circumstances can one contemplate the heavens (11-14), and finally prays for the support of Jupiter and his *pax* (16). For all of these authors, the wars that threaten to destabilize the didactic tradition are civil wars, and the basic point is that didactic poetry cannot function in a time of civil strife. This is a topos that Lucan’s

critique of didactic poetry vividly demonstrates. Figures such as Amyclas and Pompey's helmsman have no substantive role to play in a world on the verge of collapse, and poets like Nicander and Virgil appear irrelevant. The literary tradition to which these figures belong cannot find an audience in the midst of civil war. But this is also a topos that Acoreus overturns. In Egypt, Caesar is no longer engaged in civil war. Acoreus, an Egyptian, takes control of the Greek scientific tradition and the Roman tradition of scientific poetry and turns them against the invading enemy. The foreign priest configures himself as a new kind of Ur-poet with a new kind of Ur-poem. In the process, Acoreus completely dismantles the familiar norms of didactic poetry and leaves the reader to wonder at the naïve simplicity of other didactic poets. That Acoreus does so in Alexandria, the capital city of ancient science and poetry, dramatically underscores the contrast between his didactic undertaking and the work of his flesh and blood didactic predecessors and contemporaries.

In Lucan's self-imploding universe, the didactic tradition can assert itself and claim an audience only by abandoning the familiar norms according to which it traditionally operates. Instead of singing about *rerum natura*, the successful didactic poet sings about the unknowable and the unanswerable. Instead of offering a simple lesson that leads towards truth and understanding, the didactic *vates* weaves a complicated web of misdirection that shuts down the possibility of scientific inquiry and challenges or tests the student's pretensions. Whereas traditional didactic poets passively lament the devastation of war and pray for peace, this new kind of didactic poet deviously behaves *velut in tuta pace* but takes an active role in war and enchants his student long enough for his enemies to resume the fight. In the primordial chaos of the Libyan desert, the familiar kind of didactic poet finds himself hamstrung and unable to offer the assistance that he regularly claims to provide. At the edges of the known world, beside the

river Nile, another kind of didactic poet turns the didactic tradition upside down and puts it to use in a strange and unsettling way.

Conclusion

The preceding chapters have explored the various ways in which Manilius, the *Aetna* poet, and Lucan negotiate and probe the relationship between scientific inquiry and hexameter poetry. At the outset, I suggested that all three authors engage with a common set of issues. Here, I want to do two things. First, I want briefly to review and clarify the issues that connect these authors and to compare the attitudes that each author adopts. Second, I want to examine some of the limitations of the dissertation as a whole and to explore a few of the problems that it raises, but which fall outside the scope of the present work.

I will begin with the points of commonality. On the one hand, all three authors prompt their readers to reflect on the ability of poetry to communicate scientific knowledge. Manilius offers the most positive assessment. Poetry's mathematical meter constitutes the ideal medium for investigating the mathematical nature of the universe, and performing mathematical tasks in verse reveals the true order and regularity that are the cosmic *deus*. But it is only one specific poetic genre and one specific scientific discipline that happily coexist, namely, hexameter poetry and mathematical astrology. Other poetic traditions and other scientific fields, Manilius implies, share no intrinsically valuable connection and cannot claim any kind of privileged status. In the world of the *Aetna*, however, poetry itself is intimately and almost hopelessly connected with traditional mythological narratives that fundamentally misrepresent the natural world. When it has been stripped of such narratives, poetic meter can easily accommodate and explain the scientific *causae* of natural phenomena, and there is no indication that one any one discipline claims priority over another because of an inherent link between the natural world and poetic form. And yet, the *Aetna* poet refuses to reduce his environment to the level of merely

mechanical or physical *causae*. Scientific analysis correctly and methodically explains the workings of the natural world, but it is essential that literary history and moral philosophy give that world full meaning and significance. A similar sentiment pervades the *Bellum Civile*. Although he writes from a deeply literary and philosophically engaged perspective, Lucan regularly explains natural phenomena with and through the tools of scientific analysis, and conspicuously rejects the kinds of familiar mythologies that the *Aetna* poet so vehemently attacks. Nevertheless, Lucan fundamentally undermines and rejects the entire tradition of writing scientific poetry about the natural world. This tradition constitutes an alternative to Lucan's own brand of *epos*, one that Lucan characterizes as politically disengaged and ultimately divorced from reality. Writers like Manilius and the *Aetna* poet have no place in Lucan's tempestuous universe, where only foreigners and barbarians, free from the pollution of civil war, can sing songs about the natural world.

On the other hand, although they remain firmly committed to explaining the natural world from a scientific perspective, all three authors question the value of scientific knowledge and prompt the reader to reflect on the extent to which such knowledge actually possesses practical benefits. As we have seen, didactic poets regularly claim to equip their readers with useful or necessary information, and Manilius ostensibly teaches his audience how to cast a reliable horoscope. But despite this basic premise, the poem does not include nearly enough information to allow anyone to cast a complete horoscope, and more than anything else, Manilius seems intent on revealing and endlessly contemplating the mathematical complexity of the divine *ratio* of the cosmos. His polemical attacks on his didactic predecessors, his outright rejection of other scientific *artes*, and his subordination of other fields of inquiry to mathematical astrology all suggest a devaluation of the practical application of scientific learning. The *Aetna* poet states

his position more clearly. For him, the scientific contemplation of natural philosophical *causae* constitutes *iucunda voluptas* and serves no practical purpose whatsoever. Whereas Manilius implies that such contemplation reveals the inherent order of the cosmos, the *Aetna* poet argues that this kind of inquiry creates order and gives structure to what would otherwise be an undifferentiated mass of material. Like Manilius, however, the *Aetna* poet promotes this kind of contemplation above all else and finds fault with those who do not adopt a similarly speculative attitude towards their environment. By refusing to learn the true *causae* of natural phenomena, sightseeing tourists simply do not pay the natural world the respect that it deserves, and such practically minded individuals as miners and farmers, not to mention the poets with whom they are associated, actually violate or abuse that world. Nature itself seems to demand scientific speculation and celebration in song, and both the *Aetna* poet and Manilius figure these related projects as fundamentally ethical or even religious undertakings.

It is not surprising that Lucan goes even further. Lucan implicitly subscribes to the idea that the natural world can and should be explained from a scientific perspective. In stark contrast to the systems of Manilius and the *Aetna* poet, though, those who possess this kind of theoretical knowledge repeatedly try to put it to good use, but fail spectacularly time and again. Figures like Amyclas and Pompey's helmsman cannot persuade others to take their scientific advice, and the *Theriaca* tradition manifestly offers no practical wisdom or tangible benefits to those who suffer the injuries it claims to be able to treat. Acoreus offers a slightly different model. From Caesar's perspective, Acoreus represents a kind of pure science, and he delivers a lesson about a natural phenomenon that does not claim to serve any practical purpose. Of course, Acoreus exploits the general's enthusiasm for this sort of speculative learning, and turns his abstract song into an instrument of war. And yet, in the end, even that maneuver fails, and Caesar ultimately escapes

unharméd. In a world where the order of the cosmos threatens continually to collapse, scientific inquiry into that order seems quaint or even downright dangerous, but it never accomplishes anything.

These poems, then, explore similar issues and adopt similar points of view. By reading these works together, this dissertation allows us to grasp their points of contact and to contrast the nuances of their respective positions. At the same time, however, both the individual chapters and this brief summary raise a number of questions that fall outside the actual scope of the dissertation itself. In what follows, I would like briefly to address some of these questions.

The choice of texts itself runs the risk of appearing arbitrary. It was pointed out in Chapter 1.2 that several earlier Latin poems explore issues relevant to those authors under consideration here, and the preceding chapters have deliberately focused on texts that have received considerably less attention in recent scholarship. I have not offered, nor have I claimed to offer, an exhaustive account of the relationship between science and poetry at Rome in the first century CE. Such an account would necessarily consider the role of scientific theory in Persius, Seneca's tragedies, the Flavian epicists, Statius' *Silvae*, Juvenal, and others. It would also need to explore the utility of both scientific knowledge and poetry as presented in such texts as the *Aratea* ascribed to Germanicus, Grattius' *Cynegetica*, and the tenth book of Columella. For the most part, I suspect that these works would offer judgments and perspectives that contrast with, rather than complement, the works that I have actually analyzed. What has emerged is a coherent argument about one particular group of poems, and it remains to be seen how the attitudes of this group correspond to or conflict with those of their near contemporaries and successors.

Similarly, although my goal has been to examine the relationship between science and poetry, the questions that I ask and the arguments that I make might benefit from a sustained analysis of contemporary prose texts. Several Imperial prose treatises weigh in on the relationship between science and poetry, either overtly or implicitly, and these same texts sometimes probe the practical value of scientific knowledge in relevant and exciting ways. Seneca's *Natural Questions* provides a germane example. Throughout that work's extended analyses of meteorological theory, Seneca repeatedly cites and engages poets such as Virgil and Ovid. At the same time, one could argue that Seneca himself calls into question the basic methodological principles of a writer like the *Aetna* poet and continually undermines the possibility of putting scientific knowledge to practical use. In his analysis of earthquakes, for instance, Seneca adopts the arguments of Epicurus and Lucretius, suggesting that a scientific understanding of the natural world can free us from fear of natural disasters.¹ But instead of minimizing the potential dangers of nature, Seneca constructs a dramatic topography that abounds with hidden and inescapable threats: earthquakes are omnipresent and strike with devastating consequences. Such startling vignettes emphatically undercut the ostensible Epicurean or Lucretian message of the book and isolate the reader in a hostile environment where scientific inquiry seems utterly pointless. Like the poetic authors with whom I am concerned here, Seneca seems to adopt a fundamentally ambivalent attitude towards the utility of scientific learning. From this perspective, it is highly significant that both Lucan and the *Aetna* poet are familiar with Seneca's works. Numerous critics have shown that the speech of Acoreus in *Bellum Civile* 10 depends, at least in part, on Seneca's fragmentary account of the Nile (*NQ*

¹ For a recent treatment of *NQ* 6, see Williams 2006.

4a), and others have located a wide variety of Senecan influences in the *Aetna*.² A broader examination of scientific theory in early Imperial Rome would need to take these kinds of influences and arguments into account, and would attempt to correlate or compare poetic texts with prose treatises.

A related problem is the need to compare contemporary Greek texts, either verse or prose. It is possible to trace the majority, if not all, of the scientific theories considered in the preceding chapters back to Greek sources, and one wonders to what extent first century CE Greeks concerned themselves with issues similar to those that interested their Roman counterparts. Here, Plutarch's *Moralia* might play an important role. An analysis of scientific theory in a text such as *How the Young Should Study Poetry* (14d – 36b), which vigorously seeks to limit the utility of verse, might yield interesting results. Of course, the *Moralia* contains a number of treatises that explore or deploy scientific theory, ranging from *What Plato Meant By Saying That God Is Always Doing Geometry* (718b – 720c, part of the *Convivial Questions*) to Plutarch's own *Natural Questions* (910c – 919e). In the present context, the short dialogue *On the Face in the Moon* (920b – 945d) might prove particularly suggestive.³ This work contains a good deal of scientific theory derived primarily from the fields of optics and astronomy, and Plutarch even cites Hipparchus and Aristarchus by name. The dialogue's conclusion, however, relates a lengthy mythological narrative about the moon and implicitly encourages the reader to reflect on the relationship between, and the relative values of, scientific and non-scientific modes of discourse. Although the structure of the work and its dramatic conclusion clearly evoke Platonic models, the dialogue itself might repay further investigation in connection with Roman

² Diels 1885 points to a number of connections between Lucan 10 and Seneca. De Vivo 1989 provides a comprehensive account of parallels between the *Aetna* and Seneca.

³ For this work, see the recent analysis of Taub 2008: 57-78.

texts, and Roman texts might similarly be better understood in light of this kind of contemporary Greek theorizing.

Furthermore, although I have discussed the intellectual and literary backgrounds for all three texts and adduced a variety of parallels, I have generally refrained from trying to situate the texts themselves and their respective arguments within their broader cultural contexts. My aim has been to demonstrate that these works participate in a common dialogue, not to locate the individual movements of that dialogue in a particular place at a particular time. A broader study would do just this, and one might plausibly attempt, for instance, to connect the changes in attitude examined above with changes in the nature of Roman public life. It would not be difficult to connect Manilius' relatively optimistic picture of astrological knowledge with Augustan ideology. Other scholars have demonstrated that Manilius is aware of the importance that astrology played in Augustus' own political discourse, and one could argue that by tirelessly cataloging the stars and inscribing them within an undeniably Roman framework, Manilius' poem performs an ideological task similar to that of Agrippa's world map in the Porticus Vipsania or even a text such as Augustus' own *Res Gestae*.⁴ From this perspective, Lucan's hostility to didactic poetry may not come as a surprise. Whatever we make of the Pisonian conspiracy and the poet's involvement in it, recent studies have repeatedly emphasized Lucan's profound ambivalence towards Nero and the literary and political histories that produced him. One could argue that this more general cultural skepticism has left its mark on Lucan's treatment of scientific poetry. These types of argument may be overly simplistic or reductive, and I do not mean to suggest that the authors with whom I am concerned were the first to develop such

⁴ Cf. Bajoni 2004: 105-6, who connects Manilius with Vitruvius, Agrippa, Ovid's *Fasti*, and Verrius Flaccus. Abry 2011 provides another intriguing recent attempt to connect Manilius with Augustan ideology.

hesitant attitudes, or that such attitudes can only surface in one particular kind of political climate. Chapter 1 considered just two examples of earlier Roman authors who adopted similarly points of view, and it would be possible to formulate a long list of ancient intellectuals who sought to circumscribe the utility of poetry or any one of a variety of scientific disciplines. Indeed, such a list would not even take into account the philosophical traditions of Academic or Pyrrhonian Skepticism that endeavored to undermine the epistemological basis of all knowledge and with which our authors have very little in common.

Finally, just as I have avoided discussing broader cultural changes that may have influenced our authors, I have also refrained from considering the more fundamental intellectual developments that may have led to a gradual increase in skeptical or cautious appraisals of the value of scientific knowledge. It is tempting to speculate, however, that by the first century CE there may have been a sense that scientific inquiry had reached its limits in general. A wide variety of intellectuals had been carefully observing the natural world for centuries and formulating hypotheses based on their observations. Although there was never universal agreement on all points, observation and inference may have seemed unlikely to yield further results. This state of affairs is best symbolized by Pliny's massive *Natural History*, a work that did not figure prominently in the preceding chapters, but that would deserve detailed analysis in any comprehensive account of early Imperial attitudes towards scientific inquiry and the natural world. Pliny's exhaustive compilation vividly demonstrates just how far the traditional methods of scientific investigation had gone, and intriguingly suggests that there may have been little else to add to the established body of scientific knowledge. From this perspective, it may have seemed attractive, even necessary, to find ways to talk about the natural world that combined scientific learning with other forms of discourse and that sought to restrict or temper the

potentially overwhelming influence of established scientific thought. Rome had conquered the known world and had managed to explain it from a scientific point of view. Perhaps the sense of finality that this engendered encouraged some to look for complementary ways to conceptualize their surroundings and to reconsider what they actually knew about the world they now seemed so absolutely to control.⁵

This is not the place, however, to offer such broad speculations. The dissertation itself has very narrow parameters. It has explored three texts and sought to develop two very particular arguments. We have seen that, despite a wide variety of dissimilarities, Manilius, Lucan, and the *Aetna* poet engage in fundamentally related activities and adopt fundamentally parallel points of view. All three authors reflect on the suitability of poetry to communicate scientific knowledge, and simultaneously invite their readers to question the value of or the practical benefits to be derived from that knowledge. The individual chapters have located each author within a variety of literary and scientific traditions, and the dissertation as a whole has hinted at the extent to which scientific inquiry itself constituted an exciting and challenging area for creative literary exploration in early Imperial Rome.

⁵ I do not mean to suggest that *philosophia* as a whole began at this point to turn away from the sciences and to focus more exclusively on ethical or moral problems. See Trapp 2007: 10-13.

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