A Fashionable Curiosity: Claudius Ptolemy's 'Desire for Knowledge' in Literary Context

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Abstract

This article examines in detail the second-century CE polymath Claudius Ptolemy's expression of the 'desire for knowledge', situating it against a wider backdrop of similar expressions in the Greek textual tradition. I argue that in his expression, Ptolemy creatively alludes to Plato's *Phaedrus*, a practice that, surprisingly, here ties his work more closely to contemporary oratory and the 'novel' than to generic precursors in the exact sciences. The piece thus demonstrates how an author in the highly formalized genre of mathematics employs specific textual strategies held in common with his wider, contemporary literary culture.

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> I frankly admit that I am strongly attracted by the simplicity and beauty of the mathematical schemes with which nature presents us. You must have felt this, too.
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> —Werner Heisenberg to Albert Einstein[1]

The ancient Greek exact sciences constituted a literary practice. Therefore, we may interpret them as we interpret other expressions of Greek literary culture: through textual analysis sensitive to form and style, along with close readings in comparison with other literary texts inside and outside of generic limits. Such is my basic methodological assumption for this paper, and in this I follow a growing number of scholars who have been making an ever more compelling case that an appraisal of ancient mathematical and technical texts is essential for understanding the complexities of Greco-Roman literary culture as a whole.[2] In this paper, I specifically investigate the literary dimensions of how mathematical authors express their motivations for engaging in the practices of the exact sciences, focusing on the second-century CE polymath Claudius Ptolemy's expression of what we may call the 'desire for knowledge'.[3] My own desire in this paper is twofold: on the one hand, I wish to use this expression to locate Ptolemy in his literary context, both synchronically and diachronically, in genres both outside and inside of the exact sciences. On the other, I hope to show some of the ways in which the desire for knowledge, however essential it is to human nature, is expressed through context-dependent forms. Heisenberg's frank admission of attraction perhaps reflects a modern scientific culture that values matter-of-fact expression; in contrast, we shall see how Ptolemy's desire for knowledge is expressly charged with an eroticism that animated the literary ambitions of the second century CE.

1   Ptolemy Outside of Literary Context

Despite the perennial interest in revealing the scientific dimensions of Ptolemy's writings and their place and influence in the history of science, Ptolemy is still underserved in studies of ancient science that seek to situate those writings in their wider literary and social contexts. Partly this seems due to the very form of

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[1] Heisenberg 1971: 69.

[2] An early example is Fuhrmann 1960, a formalist account of ancient handbooks, but the last decade and a half, especially, have witnessed an acceleration in shorter scholarly publications on technical and scientific writing. An important methodological essay is van der Eijk 1997, but there are still relatively few monographs that account for formal or otherwise literary aspects of ancient scientific texts, though Netz 1999 and 2009 and Asper 2007 are crucial contributions. See also Fögen 2009 for a linguistic approach to Roman technical writing, and Mattern 2008 on the form and rhetoric of medical narrative across Galen's works.

[3] The discussion here thus complements Matthew Leigh's 2013 study of curiosity that focuses on πολυπραγμοσύνη. I hope, too, that this philological investigation of mathematical desire will dovetail with recent philosophical discussions of one object of that desire, namely, mathematical beauty; cf. Rota 1997, and Müller-Hill and Spies 2011.

his mathematical enterprise: a text such as the *Mathematical Syntaxis* (hereafter, *Syntaxis*), replete with geometric proofs, tables, and diagrams, does not lend itself to easy comparison with works in other genres. Moreover, as Reviel Netz has argued, original and challenging work in the geometric sciences, exemplified by the proofs in Ptolemy's *Syntaxis*, was a marginal cultural practice even among elites in antiquity, and evidence suggests that this was especially true in Ptolemy's century.[4] Other practices with a more secure and obvious standing in ancient society have naturally garnered more attention from social historians and literary scholars. Medicine is the case in point, and the magnetic Galen has attracted the attention of scholars pursuing all manner of research question.[5] Partly, however, the general neglect of Ptolemy as a source on wider social and literary trends must be the product of his own silence about such trends. Widely recognized is the fact that, for one who wrote so much (amounting to some 300,000 words extant), Ptolemy writes surprisingly little that would clearly reveal details about his own life and cultural context. In the words of Alexander Jones: 'In [Ptolemy's writings] there is no personality, no reference to himself except as an observer, scholar, and theoretician, no allusion to his environment.'[6] Likewise we have no substantial attestations of his life or works from other sources prior to the commentaries of Pappus, Theon, and Proclus, which date to the fourth century and afterward.[7] Unlike so many of his contemporaries, Ptolemy appears never to have traveled, either to Rome or elsewhere, and we know nothing about his non-scientific activity in or around Alexandria, save for a possible connection to the temple of Serapis at Canopus.[8] Nor can we securely imagine his active involvement in the bustling social life of Alexandria itself, as a tantalizing though late (sixth-century) anecdote situates him in isolation for 40 years on the outskirts of the city.[9] In short, Ptolemy appears to have put minimal effort into creating a public image for himself; in this he is at the pole opposite to Galen.

The above merely gestures toward the serious challenges that interfere with our understanding of Ptolemy, both as a man and as a man of his time. In spite of Ptolemy's apparent detachment, however, recent studies have sought to ground him

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[4]Netz 2002. On the apparently low mathematical productivity of the second century CE, see the tables in Netz 1997: 6–10. The *Syntaxis*, of course, is entangled to some degree with astrological practices of much wider popularity, but as Bernard 2010: 513 notes, even when an astrological theory was supported by geometric models, one did not need to comprehend those models in order to calculate horoscopes from, say, numerical tables.

[5]See the recent essays and up-to-date bibliography in Gill et al. 2009. To be sure, what we would call 'astrology' occupied a position arguably comparable to medicine, and Ptolemy's *Tetrabiblos* has been an important source for investigations of it as a social practice (e.g., Barton 1994: 27–94).

[6]Jones 2010: *xi*; cf. Toomer 1975.

[7]See Jones 1990, however, for papyrological evidence of early, perhaps even contemporary, criticism of Ptolemy's lunar theory. Toomer 1985: 204 argues that the sole mention of Ptolemy in Galen's works is an interpolation from the Arabic tradition.

[8]Cf. Jones 2005a: 62.

[9]Olymp. *In Phd.* 10.4, granted some plausibility by Jones 2005a: 61–64.

in the wider scientific, philosophical, and social contexts of the second century. A brief survey: Alexander Jones and Anne Tihon have identified papyrological evidence of theoretical astronomy, similar in form to (perhaps rivaling?) the *Syntaxis*, by Ptolemy's contemporaries and immediate predecessors.[10] Aiming to more precisely define Ptolemy's immediate reception, Alain Bernard has recently argued that the *Syntaxis* was written for an audience of astrological practitioners,[11] while Jacqueline Feke has situated Ptolemy in the midst of Middle-Platonic and Aristotelian debates on ethics and epistemology.[12] Cristian Tolsa has recently brought to the fore the social context in which these debates occurred.[13] Scholarship thus continues to develop an ever-higher resolution image of Ptolemy participating in contemporary intellectual practices. Still lacking, however, is a concerted effort to examine the literary aspects of Ptolemy's achievements and situate them in a literary context, according to the interpretive methods I listed at the outset.[14] I cannot achieve that in this short paper, of course, but my hope is that an analysis of one aspect of Ptolemy's literary craft, his expression of the 'desire for knowledge', will demonstrate the interest of the larger project.

2   Ptolemy's 'Desire for Knowledge'

Let us then turn to Ptolemy's account of that desire. To begin, we shall examine a passage from the third and final book of what is probably one of his earliest works, the *Harmonics*.[15] The passage marks a pivotal moment in the treatise, when Ptolemy both announces the fulfillment of the study's primary goal and reflects on its conclusion, which is that the principles of harmonics that he has determined by geometric methods conform to what can be determined through auditory perception. He claims to have demonstrated, in other words, that rationalist and empiricist methods operate in harmony with one another. Advancing toward the concluding part of the treatise, he then describes the twofold effect that reflection on the 'harmonic power' (ἁρμονικὴν δύναμιν)[16] induces, stating:

> Since it may follow for a person who has theorized on (θεωρήσαντι) these matters to be filled with wonder (τεθαυμακέναι) immediately—if he wonders also at other things of exceptional beauty—at the extreme rationality of the harmonic power, and at the fact that

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[10]Jones 2004 and Tihon 2010.

[11]Bernard 2010.

[12]Feke 2009 and 2012.

[13]Tolsa 2013.

[14]Moving in this direction are Jones 2005b, which patiently maps out several of Ptolemy's labyrinthine rhetorical strategies, and Mansfeld 1998: 66–75 and Feke 2012: 89, which consider some formal aspects of Ptolemy's prologues. Tolsa 2013: 301–328 situates 'Ptolemy's epigram' (possibly dubious but transmitted in the manuscript tradition of the *Syntaxis*) in literary context.

[15]For a plausible sequence of Ptolemy's authorship, see Feke and Jones 2010: 200–201.

[16]For different interpretations of what, exactly, the harmonic power is, see Barker 2000: 259–263, Swerdlow 2004: 151 and Feke 2009: 69–91.

it finds and creates with perfect precision the differences of its own forms; and, on the other hand [since it may follow for him], owing to some divine love (ὑπό τινος ἔρωτος θείου), to desire (ποθεῖν) to behold, as it were, the nature of [the harmonic power] (τὸ γένος αὐτῆς ὥσπερ θεάσασθαι) and with what other things it is conjoined among the things comprehended in this world, we shall try, in summary fashion and so far as we are able, to investigate this remaining part of our theoretical undertaking, to display the magnitude of this kind of power.[17]

Untangling Ptolemy's syntax, we see that the very act of theorizing provokes two emotional reactions in the individual: wonder and desire. Ptolemy's feeling of wonder as it pertains to the activity of theory deserves its own discussion.[18] Our present focus, however, centers on his desire, and let me stress the evocative language with which he expresses it: the theorist of harmonics (whom we may understand both in a general sense and as Ptolemy and his reader) is in the grip of a divine love. That word for 'love' (ἔρωτος) especially grabs our attention, as it specifies that this is erotic passion. Moreover, the theorist desires (ποθεῖν) to behold (θεάσασθαι) both the nature (γένος) of the harmonic power and what it is conjoined with in this world. In other words, he desires to know both what the harmonic power is and how to classify it. His desire is thus the desire for knowledge. Moreover, we find similar sentiments in the *Syntaxis*. In the preface to that work, Ptolemy further describes the erotic attraction of the exact sciences, this time astronomy: therein he claims his intellectual mission as to increase 'the love (ἔρωτα) of contemplating (θεωρίας) the eternal and unchanging',[19] which is to say, the love of contemplating celestial bodies through mathematics. Moreover, Ptolemy describes those, like himself, who pursue mathematical astronomy as 'lovers (ἐραστάς) of divine beauty',[20] characterizing them, again, not by simple affection but by erotic passion. All of these evocative expressions frame Ptolemy's attitude toward investigation in the exact sciences as a desire for knowledge.

Moreover, the language that Ptolemy uses to describe that desire is not only evocative, but also (for Ptolemy, at least) rare: nowhere else in the *Harmonics*, for instance, do we find inflections of ἔρως, ποθέω or θεάομαι. Indeed, the passage cited above features Ptolemy's only use of ποθέω in the whole of his corpus. Ptolemy uses θεάομαι only once more, in the *Syntaxis*, but in what appears to be an otherwise lexically uninteresting discussion of epicycles.[21] On the other hand, ἔρως and its cognates occur a total of 13 times throughout Ptolemy's writings. Most of these, however, occur in the course of the technical discussion in the *Tetrabiblos* and concern the general affections of character variously wrought by the combinations of celestial bodies; they pertain to the motivation of neither the author nor a general figure of the astrologer. Thus we arrive at another important point: in addition to

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[17]Ptol. *Harm.* III.3 [92.1–8 Düring], translation adapted from Barker 1989: 371.

[18]For a general account of this issue in Greek thought and literature up to (pseudo-)Longinus (not including Ptolemy), see Nightingale 2004: 253–268.

[19]Ptol. *Syntaxis* part 1, p. 7.25–26 Heiberg.

[20]Ptol. *Syntaxis* part 1, p. 7.21–22 Heiberg.

[21]Ptol. *Syntaxis* part 1, p. 361.11 Heiberg.

being exceptional in their lexical form, expressions of the desire for knowledge are also confined to certain parts of Ptolemy's work. We find them only in extended 'second-order' passages, in which Ptolemy reflects self-consciously on methods, practices and, as we have seen, motivations, and which function as an introduction to or transition between extended expositions on 'first-order' (i.e., technical or theoretical) material.

3   The Desire for Knowledge in Greek Literature: A Survey

Such expressions of the desire for knowledge are thus rare in Ptolemy's works, but is the same true in Greek textual culture leading up to the second century CE? To gain an impression of how unique Ptolemy is in this regard, I conducted a series of correlated searches using the online Thesaurus Linguae Graecae (TLG). Here let me offer a few words in the way of methodology: I began with the key terms that Ptolemy himself uses that correspond to 'desire' and 'knowledge', but added as well cognate nouns and verbs (and one adjective), as well as additional nouns and verbs that seemed reasonable to include so as to further round out the impression; the full list is presented below (words in bold are found in Ptolemy's own combinations)[22]:

'Desire': **ἔρως/ἐραστής**/ἐράω/ἔραμαι/ἐρωτικός, πόθος/**ποθέω**, ἐπιθυμία/ἐπιθυμέω, ὄρεξις/ὀρέγω, ἵμερος/ἱμείρω, βούλησις/βούλομαι

'Knowledge': **θεάομαι**, **θεωρία**/θεωρέω, οἶδα, ἀλήθεια, γνῶσις/γιγνώσκω, ἐπιστήμη, μανθάνω, σοφία, πυνθάνομαι

Although I have grouped the terms under two general headings, I make no claims about synonymity within each group. Quite on the contrary, both groups obviously include terms that signify a range of concepts and activities, and even individual words may feature different nuances from one author or text to the next. But this should not matter for our purposes: a combination of any item from the first set with any item from the second generally conveys or pertains to the 'desire/desirer/desiring for knowledge/knowing'. Moreover, in this literary study, again, we are more concerned with the various expressions that signify a general concept, rather than defining precisely what the signified concept is. Other terms, too, certainly could have been included to present a more exhaustive picture of that

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[22]To set out my search methodology more precisely: I used the TLG's 'Advanced Lemma Search' function to locate combinations of each of the given terms for desire and knowledge occurring within one line of each other. For the 'desire' group, no formal constraints were set (on case, number, tense, mood, etc.), so as not to bias the search results to favor certain parts of syntax. On the other hand, since terms of knowledge are here specifically the objects of desire, certain constraints were set for this group in all searches: all noun-searches were limited to the singular genitive and accusative; verb-searches were limited to present and aorist, active infinitives, except for the cases of οἶδα, where I targeted the perfect, active infinitive, and the deponent πυνθάνομαι, where I targeted the present and aorist, middle/passive infinitive.

variety of expression. But this is foremost a study of Ptolemy, not the 'desire for knowledge' itself.[23] Thus limiting the scope to Ptolemy's own combinations and the combinations built from the other terms in each set should allow us to reach reasonable conclusions about Ptolemy's uniqueness of expression, while providing a good background-impression of other possibilities.

Just as my search aims to produce a representative, rather than exhaustive, pool of evidence, so does my ensuing discussion of that material consist of an impressionistic account of distributions especially sensitive to genre and chronology. My findings so far suggest that a more detailed analysis of the 'desire for knowledge' may tell us a lot about how culture shapes this apparently natural feature of human psychology, but to attempt this here would distract from our intended focus on Ptolemy. The present discussion instead adheres to three principles of discursive economy: first, only single instances of a particular combination (without regard for grammatical inflection) are noted for a given author, rather than a list of total counts per author or work. Tallying frequencies of each combination seems less significant for developing an impression of the temporal and generic 'reach' of an expression; the more qualitative approach I follow should bring absences and presences into conspicuous relief along those lines. Second, to frame the discussion with a simple and intuitive structure, I group the individual species of desire[24] into three genera, whose organizational logic pertains to the species' temporal and generic presence. In short, these are the common, the philosophical, and the Platonizing, and we shall examine each in turn. Third, I will be selective in my description of each genus, offering explanation only where it will be helpful for the ensuing discussion of Ptolemy.

There is no question that Greek authors leading up to Ptolemy conceived of a desire for knowledge; in what forms then did they express it? We proceed with the 'common genus'. First, a clarifying point: in my usage, 'common' indicates a wide temporal and generic distribution, not a high frequency of occurrence—though it was the case that some of these searches produced the highest returns.[25] This genus is the largest of the three, in fact the only one which encompasses more than one species of the desire for knowledge. These are πόθος/ποθέω, ἐπιθυμία/ἐπιθυμέω, ἵμερος/ἱμείρω, and βούλομαι, and they are represented in Athenian tragedy and comedy; fourth-century oratory and philosophy; the Classical and Hellenistic historians and geographers, and various prose works of the Imperial period, including our passage from Ptolemy's *Harmonics*.[26] The genus is thus indeed common, but also

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[23]Leigh 2013 develops an intellectual history of ancient curiosity which is naturally sensitive to form, but whose primary focus is on the valence of πολυπραγμοσύνη and related concepts.

[24]I treat cognate nouns, verbs, and adjectives (e.g., πόθος and ποθέω) as a single species, locating the defining features thereof at the linguistic root.

[25]Expressions based on βούλομαι number in the dozens, whereas I count only seven examples that feature ἵμερος/ἱμείρω. Uniquely in my searches, βούλησις produced zero results.

[26]The following is a representative, not exhaustive list of citations: ΠΟΘΟΣ/ΠΟΘΕΩ: θεάομαι: Ph. *Jos.* 204; Plu. *Demetr.* 6.5; Ptol. *Harm.* 3.3. ἀλήθεια: Ph. *Aet.* 2; S.E. *M.* Pr.6. οἶδα: S. *Tr.* 632; E. *IT.* 542; Pl. *Men.* 84c; Arist. *PA.* 644b26; Str. 2.5.18; Luc. *Icar.* 4. θεωρία: Th. 6.24.3.

textured: as we might expect, certain terms in the 'knowledge' set (i.e., ἀλήθεια, ἐπιστήμη) appear exclusively in philosophical or quasi-philosophical discourses. It is also not all-pervasive: we notice particular absences in poetry other than Athenian drama, and it does not feature prominently in pre-Imperial medical discourse or the fragments of Hellenistic philosophy.[27] Most glaring for us is the absence of the expression from the exact sciences. All of these absences may simply be an effect of the survey's limited scope, however, and later in this essay I will examine more closely texts in the exact sciences as we try to understand Ptolemy's generic position.

The second genus, the 'philosophical', solely entails the desire-complex ὄρεξις/ ὀρέγω. It appears less frequently overall, and then only in texts of a philosophical or quasi-philosophical nature (e.g., Nicomachus' *Introductio arithmetica*, Theon of Smyrna's *De utilitate mathematicae*, and the Galenic corpus; I count only one exception in Dionysius of Halicarnassus' *Roman Antiquities*).[28] An array of

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θεωρέω : not found. ἐπιστήμη: Ph. *Op.* 77; Plu *Adv.Col.* 1118b. γνῶσις: Str. 13.1.1; Plu. *Adv.Col.* 1118b. γιγνώσκω: Ph. *Virt.* 215; Plu. *De genio* 590a; Gal. *MM.* K vol. 10, p. 714.17. μανθάνω: E. *Ion* 1432; Ph. *Fug.* 8; D.H. 7.66.1; Max.Tyr. 8.4; S.E. *M.* 9.75; Luc. *Trag.* 209. σοφία: Ph. *Op.* 5; Max.Tyr. 25.1; Luc. *Merc.cond.* 25. πυνθάνομαι: Plu. *Quaes.Rom.* 266b. ΕΠΙΘΥΜΙΑ/ ΕΠΙΘΥΜΕΩ: θεάομαι: Pl. *Ti.* 19b; Arist. *Rh.* 1370a26; D.S. 13.9.3; Ael. *NA.* 16.39; Gal. *PHP.* 5.7.48. ἀλήθεια: Gal. *MM.* K vol. 10, p. 457.14. οἶδα: Ar. *V.* 86; Pl. *Grg.* 474c; Luc. *VH.* 2.20. θεωρία: not found. θεωρέω: Pl. *Lg.* 951a; Epicur. *Ep. ad Pythoclem* 94. ἐπιστήμη: Arist. *Pol.* 1288b17; Gal. *Quod animi mores* K vol. 4, p. 772.3. γνῶσις: D.H. 11.36.1. γιγνώσκω: LXX *Is.* 58.2; D.S. 10.8.3; Gal. *Loc.Aff.* K vol. 8, p. 144.7. μανθάνω: Ar. *Nu.* 656; Pl. *Hp.Mi.* 369d; X. *Cyr.* 4.3.15; Arist. *Rh.* 1371a32; Erot. 29.8; Plu. *De Pyth.* 395e; App. *Pun.* 430. σοφία: Ar. *Nu.* 412; Pl. *Phd.* 96a; LXX *Wi.* 6.20; S. 15.1.64; J. *Ap.* 1.111. πυνθάνομαι: Ar. *Lys.* 486; Is. 3.8; Plu. *De comm.* 1066d.

IMEΡOΣ/IMEIΡΩ: θεάομαι: Ph. *Praem.* 39; Ael. *NA.* 11.17. ἀλήθεια: S.E. *M.* 1.42. οἶδα: not found. θεωρία: not found. θεωρέω: not found. ἐπιστήμη: not found. γνῶσις : not found. γιγνώσκω: not found. μανθάνω: S. *Fr.* 314.134 Radt; Plb. 14.Pr.4; Ph. *Cont.* 75. σοφία: Ph. *Spec.leg.* 1.50. πυνθάνομαι: not found.

BOΥΛOMAI: θεάομαι: Ar. *Th.* 234; Pl. *R.* 327a; Plb. 7.12.1; D.S. 17.116.5; Ael. *VH.* 14.17; Plu. *Cat.Ma.* 17.4; Gal. *AA* K vol. 2, p. 630.8. ἀλήθεια: not found. οἶδα: Hdt. 1.86; Hp. *Aph.* 5.59; E. *Alc.* 140; Ar. *Nu.* 250; Th. 1.52.2; Pl. *Lg.* 629c; X. *Cyr.* 8.4.11; Isoc. 17.9; D. 19.227; Aesch. 3.199; Arist. *EE.* 1216b22; Plb. 4.38.12; D.H. *Dem.* 50; J. *AJ.* 1.325; D.Chr. 4.67; Gal. *Dig.puls.* K vol. 8, p. 955.17. θεωρία: not found. θεωρέω: Th. 5.18.2; Alc. *Od.* 86; D. *Ep.* 4.5; Arist. *Cael.* 300b20; D.S. 19.52.4; Gal. *Dig.puls.* K vol. 8, p. 944.8. ἐπιστήμη: not found. γνῶσις: not found. γιγνώσκω: S. *Fr.* 1130.3 Radt; Pl. *R.* 572b; X. *Mem.* 1.2.42; Arist. *De an.* 402a14; LXX *To.* 5.14; Plb. 1.1.5; D.S. 5.77.3; J. *AJ.* 12.100; D.Chr. 31.38; Gal. *Lib.prop.* K vol. 19, p. 9.1; Aesop. 50.6. μανθάνω: S. *Ph.* 233; E. *El.* 229; Ar. *Nu.* 239; Pl. *Sph.* 232d; X. *HG.* 6.5.52; D. 23.2; Agatharch. 14.6; Plb. 21.41.5; Str. 2.5.43; Ph. *Jos.* 56; D.H. 4.66.1; J. *BJ.* 7.454; Plu. *Crass.* 28.4; Ruf. *Syn.puls.* 3.3; Vett.Val. 8.8; S.E. *M.* 8.87; Ael. *NA.* 5.42; Gal. *PHP* 1.6.4; Luc. *VH.* 1.5. σοφία: not found. πυνθάνομαι: Hdt. 6.69; E. *Hipp.* 910; Ar. *Nu.* 482; Th. 8.19.1; Pl. *La.* 191d; X. *Oec.* 7.2; D. 4.10; Arist. *Top.* 161b5; Plb. 11.28.11; Plu. *De genio* 577e; S.E. *P.* 2.211; Gal. *De semine* K vol. 4, p. 527.18.

[27] I count only two instances of βούλομαι εἰδέναι in the Hippocratic corpus: *Aphor.* 5.59 and *De semine* 13.23, and one instance of ἐπιθυμέω θεωρεῖν at Epicur. *Ep. ad Pythoclem* 94.

[28] ΟΡΕΞΙΣ/ΟΡΕΓΩ: θεάομαι : not found. ἀλήθεια: Pl. *R.* 485d; Plu. *De recta* 48c; Ptol. *Judic.* p. 5 Lammert; Gal. *De const. artis* K vol. 1, p. 244.16. οἶδα: Arist. *Metaph.* 980a21. θεωρία: Alcin. *Intr.*

Classical and Imperial authors are represented within the relatively small set of results, but the expression does not seem to have been in high favor. I have found only one instance in Plato and none in Philo of Alexandria, both of whom are well-represented in the other genera, and any 'desire for knowledge', at least expressed in the terms of this study or the fragments we have, does not feature in the discourse of the Hellenistic philosophical schools.

Our last genus, the 'Platonizing', is composed only of those expressions of desire defined by ἔρως and its cognates.[29] A seemingly more descriptive label for this genus might be 'Imperial', as in fact most instances occur in a range of prose works beginning with those of Philo of Alexandria; in addition to Philo's hybrid writings, we find a high amount of oratory, medical writing, a Platonic handbook, one Plutarchian life, and only now, with Ptolemy, texts in the exact sciences. Prior to Philo we find only four instances of the genus: two from the Platonic corpus and one each from Sophocles and Euripides.[30] What then justifies the Platonizing label? The tragedians deny Plato any claim to inventing the eroticization of knowledge,[31] and Plato was in any case not the first to conceptualize ἔρως in terms abstract from personal relationships.[32] But as is plain from such dialogues as the *Phaedrus* and *Symposium*, developing the philosopher and his pursuit of knowledge in expressly erotic terms was a defining aspect of Plato's philosophical project.[33] Moreover, a TLG survey of Plato's use of ἔρως and its cognates reveals other knowledge-terms subject to them,[34] and further TLG searches confirm that an erotic desire for these is exclusive to Plato's dialogues until Philo.[35] Hence there does seem something definitively Platonic about the erotic desire for knowledge. And for now let me propose that its implementation by Imperial authors was a consequence of

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27.4. θεωρέω: not found. ἐπιστήμη: Arist. *De an.* 433a6; Gal. *Syn.puls.* K vol. 9, p. 431.2. γνῶσις: D.H. 1.1.3; Theon Sm. 1.11. γιγνώσκω: Gal. *Diff.resp.* K vol. 7, p. 889.1. μανθάνω: Gal. *Ars med.* K vol. 1, p. 224.3; Cels. *Apud Originem* 6.18. σοφία: Nicom. *Ar.* 1.2.3; Alcin. *Intr.* 1.1; Gal. *MM.* K vol. 10, p. 114.18. πυνθάνομαι: not found.

[29]ΕΡΩΣ/ΕΡΑΣΤΗΣ/ΕΡΑΩ/ΕΡΑΜΑΙ/ΕΡΩΤΙΚΟΣ: θεάομαι: Ph. *Praem.* 38; Ptol. *Harm.* 3.3 (with ποθεῖν). ἀλήθεια: Pl. *R.* 501d; Ph. *Spec.leg.* 1.59; Alcin. *Intr.* 1.2; Max.Tyr. 16.2; Gal. *Nat.fac.* K vol. 2, p. 179.13; Ael. *NA.* 2.11. οἶδα: not found. θεωρία: Ptol. *Synt.* 1.7; Gal. *Dig.puls.* K vol. 8, p. 860.5. θεωρέω: not found. ἐπιστήμη: Pl. *Ti.* 46d; Ph. *Op.* 77; Thess. *Virt.herb.* Pr.5. γνῶσις: not found. γιγνώσκω: not found. μανθάνω: E. *Hipp.* 173; Max.Tyr. 11.11. σοφία: Ph. *Op.* 5; Plu. *Sol.* 2.2; D.Chr. 36.40; Max.Tyr. 18.5; Ael. *NA.* Ep.1. πυνθάνομαι: S. *OC.* 511.

[30]Another might be found at E. *Fr.* 889.1 Nauck: παίδευμα δ᾽Ἔρως σοφίας, but in context σοφίας is better construed quasi-subjectively with παίδευμα, rather than as the object of Ἔρως.

[31]Could the precedents from tragedy be yet further evidence of Plato's appropriation of poetic discourse for his construction of philosophy, as argued by Nightingale 1996?

[32]ἔρως is widely conceived as a passion for *polis* and power in fifth-century poetry and prose. For discussion, see Cornford 1907: 201–220; Arrowsmith 1973; Rothwell 1990: 37–43; Connor 1992: 96–98; Nightingale 1996: 187–188.

[33]The implications of this are explored in Halperin 1985. Cf. Nightingale 1996: 128–129.

[34]μάθημα (*R.* 485b), τὸ ὄν (*R.* 501d), νοῦς (*Ti.* 46d), φρόνησις (*Phd.* 68a), τὸ ἀληθές (*Phlb.* 58d).

[35]The question of why other authors apparently avoid this complex of expressions until the Imperial period cannot be answered here; more searches are warranted and may of course qualify the result.

the centrality of Plato's texts to Greek literary culture and education, as well as to Plato's otherwise well-documented influence on individual works by authors such as Philo, Maximus of Tyre, and Galen (which is not to reduce any of these to being mere 'Platonists').[36] Thus Imperial authors who render the desire for knowledge in erotic terms draw it closer to its presentation in a celebrated, Classical source; they Platonize it.

4   Ptolemy's Choice

The foregoing survey displays some of the range and texture that characterize the expression of the desire for knowledge in the Greek literary tradition through the second century CE. To refocus the discussion on Ptolemy, the key point is that to him as an author, that tradition offered a variety from which he could *choose*.[37] By choosing to cast that desire in consistently Platonizing terms, Ptolemy acts entirely in keeping with the Platonic philosophical currents that influence his texts,[38] as well as with the literary practice of other writers of his era. Noting the apparent expectedness of this choice, we might question how interesting it can even be— is Ptolemy's desire for knowledge, even in its erotic fervor, nothing more than a literary *topos*? Here we turn to literary criticism for guidance. In his study of allusion and intertextuality in Augustan poetry, Stephen Hinds observes that '*topos*' hardly constitutes an 'inert category': a Virgil does not simply insert a poetic commonplace pre-fabricated into his verses, but creatively reconfigures it, varying details and the manner of expression, thus transforming it into something 'new and fresh'.[39] Could Ptolemy be doing something similar?

Ptolemy's expressions of desire in the *Syntaxis* are perhaps too brief to yield much interpretive fruit; instead we shall focus on his extended statement in the *Harmonics*. Let me offer again the key phrase: 'It may follow for him who has theorized on these matters, owing to some divine love (ὑπό τινος ἔρωτος θείου), to desire (ποθεῖν) to behold, as it were, the nature of the harmonic power (τὸ γένος αὐτῆς ὥσπερ θεάσασθαι).' Even if the desire for knowledge expressed

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[36]See De Lacy 1974 and now Hunter 2012 for Plato's influence on Imperial literary culture, and Trapp 1990 on the particular prominence of Plato's *Phaedrus*, one of the key sources for Platonic ἔρως. Mansfeld 1994: 58–107 describes the pedagogical context. For Platonic influence on Philo, Maximus, and Galen, see Dillon 1977: 139–183; Trapp 1997: *xxii–xxxii*; and De Lacy 1972.

[37]The fact that he made *any* positive choice reveals something about the generic history of the exact sciences: we noted the apparent absence of the desire for knowledge from any Hellenistic mathematical works. As our survey was admittedly limited, we shall examine these texts in more detail below.

[38]See, for example, the editorial notes on *Harm.* 3.3–5 in Barker 1989: 373–377; Taub 1993, esp. 31–34; Feke 2009; Feke 2012; Tolsa 2013, esp. chapters 1–3. Like other Imperial writers, of course, Ptolemy is not swept entirely away by those currents, but demonstrates a notable degree of eclecticism; Feke 2009: 221 brands his philosophy 'Platonic empiricism'.

[39]Hinds 1998: 40.

here is merely a *topos*, that consideration requires two qualifications in view of Hinds. First, Ptolemy is not quoting anyone. The exact form of the statement is not formulaic nor found elsewhere, but is Ptolemy's own. Second, Ptolemy reconfigures the key terms ἔρως, ποθέω, and θεάομαι in a unique manner: a TLG search produces Philo of Alexandria's description of an 'immense desire (ἔρωτι) to see (θεάσασθαι)', immediately qualified as a πόθον, as the only precedent for those terms in such close composition.[40] Unlike Philo, who in effect equates the two desires, Ptolemy distinguishes ἔρως from the action of πόθος by rendering the former as the source of the latter. At least in its expression, then, Ptolemy's desire for knowledge is conceptually more developed than that of other authors. If the 'desire for knowledge' is a *topos*, Ptolemy's is not typical.

5   Ptolemy's Platonic Enthusiasm

Indeed, by developing the expression so vividly in the *Harmonics*, Ptolemy can be seen to be making a specific, textual allusion to Plato's *Phaedrus*. That Ptolemy should refer to Plato at all is not surprising, given the Athenian philosopher's contemporary prominence and, more specifically, his clear influence on Ptolemy.[41] Up to now, however, this connection has received little attention from scholars who have pursued other questions.[42] But the passage is significant, for as will be made clear, the allusion to the *Phaedrus* situates Ptolemy in an unexpected literary context, and the nature of the allusion itself suggests something about his authorial aspirations. Let us then examine how this allusion works.

The allusion operates on two levels: first, there is a lexical correspondence between key terms from the *Harmonics* and the *Phaedrus* (in the absence of any explicit naming of Plato or the dialogue, this is how we recognize the allusion at all). The verb ποθέω is used four times in the dialogue: once by Socrates to invite Phaedrus to ask if he desires anything (*Phdr.* 234c); twice to describe the mutual desire of the lover and the beloved to be near each other (*Phdr.* 255d); and once to describe a soul 'full of desire' (ποθοῦσα) that races wherever it hopes to 'see' (ὄψεσθαι) a beautiful boy (*Phdr.* 251e). Forms of θεάομαι occur five times in the dialogue, denoting the beholding of various objects: true things (*Phdr.* 247e); the earthly namesake of beauty (*Phdr.* 250e); men of certain classes (*Phdr.* 271d); the writings of great writers (*Phdr.* 258c); and, most important for our discussion, the nature (γένος) of the earthy imitation of the forms of justice, temperance, etc. (*Phdr.*

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[40]Ph. *Praem.* 38. The result followed TLG Advanced Lemma Searches for combinations of ἔρως/ἐραστής/ἐράω/ἔραμαι/ἐρωτικός, πόθος/ποθέω, θεάομαι occurring within one line of each other. After Ptolemy's *Harmonics*, the next instance is Ps.-Luc. *Am.* 53, perhaps from the early fourth century.

[41]See nn. 36 and 38 above.

[42]Tolsa 2013: 84 briefly notes lexical correspondence between the *Harmonics* passage and the *Phaedrus*.

250b). The various inflections of ἔρως are used too frequently to account for all instances here, but we may note that Socrates does call it 'a god or something divine' (*Phdr.* 242e: θεὸς ἤ τι θεῖον ὁ Ἔρως).

Here I offer two observations: first, beyond the basic correspondence of individual words between the two texts, we also find several instances of correspondence between word-groupings: thus, from the passages surveyed above, compare Socrates' statement in the dialogue that if not a god, '*erôs* is something divine' (τι θεῖον ὁ Ἔρως) with Ptolemy's description of 'divine *erôs*' (ἔρωτος θείου) in the *Harmonics*. Moreover, there is a strong correspondence between the statement in the *Phaedrus* that souls 'behold the nature' (θεῶνται τὸ . . . γένος) of the earthly imitations of the forms of justice, etc., and that found in the *Harmonics* concerning the theorist's desire to 'behold the nature' (τὸ γένος . . . θεάσασθαι) of the harmonic power (nor should we overlook the fact that in both the *Phaedrus* and the *Harmonics*, the objects whose nature is being regarded—on the one hand, the forms of justice, temperance and the like, and on the other hand, the harmonic power—are objects of pronounced beauty[43]). Lastly, while there is not the same, precise lexical correspondence in the verbs of sense-perception, the statement in the *Phaedrus* describing the soul 'full of desire' (ποθοῦσα), racing wherever it hopes to 'see' (ὄψεσθαι) a beautiful boy, overlaps semantically with the phrase found in the *Harmonics* concerning the theorist "desiring to behold" (ποθεῖν . . . θεάσασθαι) the nature of the harmonic power.

The second observation is less obvious but critical for the present analysis: except for three exceptions,[44] all of the terms in the *Phaedrus* that correspond to those in the *Harmonics* occur in Socrates' second speech to Phaedrus (*Phdr.* 244a–257b).[45] There he vividly describes the philosophical lover whom others think simply mad, but whose madness is in fact inspired by a divine love (ἔρως). Socrates tells us that prior to the lover's present life, his soul had caught a glimpse of true beauty in the course of its heavenly flight. Now embodied in the lover, it beholds the nature of beauty and the concepts of justice and temperance, all manifest in young boys (*Phdr.* 250b). Recollecting these true forms, the soul of the lover, now full of desire, races toward wherever it hopes to see them (*Phdr.* 251e).

The account, brief as it is, should strike a familiar chord after the preceding comparison between the *Phaedrus* and *Harmonics*. The same passages that comprise the account of Plato's madman-lover are the same that were analyzed in the discussion of lexical overlap, and my conclusion is by now obvious: I submit that Ptolemy has shaped his theorist of harmonics—under the influence of divine love, desiring to behold the nature of the harmonic power—specifically in the image of Plato's inspired lover. This, then, is the second level of Ptolemy's allusion: the passage in

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[43]See Feke 2009: 91–97 and Barker 2010 on beauty in Ptolemy's *Harmonics*.

[44]Socrates asking whether Phaedrus 'desires' anything (*Phdr.* 234c); 'beholding' the writings of great writers (258c) and men of certain classes (271d).

[45]Or, in the case of 'divine *erôs*' alone, in Socrates' recantation, which introduces the speech.

the *Harmonics* evokes not only Platonic language, but also a uniquely conceived character from a particular dialogue.

6   The *Phaedrus* in Greek Imperial Literature

The choice of dialogue is itself significant in view of Ptolemy's historical context. In the second century the *Phaedrus* exerted an especially powerful influence over textual culture.[46] The text itself was widely read, providing a model for literary style, and the dialogue inspired explicit engagement on the part of orators, writers of narrative fiction, and, no less, Galen.[47] Thus the impression of Michael Trapp:

> It must have been hard for the *pepaideumenos* to emerge from his education, whether rhetorical, philosophical, or both, without having been invited to study and admire this dialogue, and without having come to regard it as a proper model for imitation in his own literary products.[48]

The soul and passions of the madman-lover was itself a popular motif for imitation and allusion.[49] What is therefore interesting about its presence in the *Harmonics* is that it nudges Ptolemy out of the apparent social isolation of the exact sciences and into company with sophists, fiction-writers, and learned doctors.[50] Ptolemy's choice to allude to the dialogue's madman-lover, then, may reveal more about him as a prose-stylist than as an authority on harmonic theory.

To deepen our understanding of how the literary potential of the *Phaedrus* was realized in the second century, let us consider how a contemporary prose-stylist uses its language of eroticized psychology. Here we turn to Longus, author of the narrative fiction we know as *Daphnis and Chloe*.[51] The work opens with a narrative conceit, itself reminiscent of the *Phaedrus* in its detail and narrative timing: in a prologue, the narrator describes how inspiration to write the story seized him while

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[46] A culture commonly referred to as the 'Second Sophistic', on which see Whitmarsh 2005.

[47] See De Lacy 1974: 6–8 and especially Trapp 1990, which includes an appendix that registers allusions to the *Phaedrus* (including the 'soul of the lover') from numerous authors and works; Ptolemy is not included. Cf. Hunter 1997; Hunter 2012: 151–184; and Rocca 2006 on Galen. Papyrological records from the CEDOPAL database (http://www2.ulg.ac.be/facphl/services/cedopal/), accessed on February 17, 2013, corroborate the dialogue's popularity in the Imperial period: out of 105 fragments of Plato, 8 are from the *Phaedrus* (three of which, moreover, feature text from Socrates' second speech). This number is exceeded only by the *Republic* (13), *Phaedo* (11) and *Laws* (10), but the *Phaedrus*' tally is especially impressive given the substantially greater length (and therefore, the greater odds of survival) of those other works.

[48] Trapp 1990: 141.

[49] For a sizeable list of allusions, see Trapp 1990: 172; to this we might add Gal. *Nat.fac.* K vol. 2, p. 179.12–15.

[50] Feke and Jones 2010: 200–201 situate the *Harmonics* early in Ptolemy's career; might its author be Trapp's young *pepaideumenos*, eager to demonstrate his rhetorical-philosophical education? Tolsa 2013: 201–203 contends that Ptolemy frames another early work, *On the Criterion*, as a rhetorical exercise.

[51] On date, author, and title, see Hunter 1983: 1–15.

hunting in the picturesque, natural setting of a *locus amoenus*.[52] There he happened upon a richly evocative painting, the details of which he describes to the reader in a tasting menu of sorts, featuring samples of the narrative delights that follow in the course of the work:

> Women giving birth, others dressing the babies, babies exposed, animals suckling them, shepherds adopting them, young people pledging love, a pirates' raid, an enemy attack— I gazed in wonder (ἰδόντα με καὶ θαυμάσαντα) at many other things, all of them erotic (ἐρωτικά), and a desire (πόθος) took hold of me to write in response to the painting (ἀντιγράψαι τῇ γραφῇ).[53]

Passing over the alluring details of the painting, we focus instead on the narrator's professed reaction to them. Like Ptolemy, Longus' narrator describes his motivation as desire operating in tandem with vision and erotic love (and wonder, no less). Their conceptual vocabulary of motivation is thus essentially the same, essentially Platonic. That Longus presents those concepts in a different permutation does not undermine this.[54] The point, again following Hinds, is that allusion is not numb imitation, but entails some degree of creative refashioning. Moreover, in Longus and other second-century authors, this refashioning entails not only introducing evocatively Platonic language and concepts into new literary contexts, but sometimes actually redefining what those concepts are, even to the point of contrasting them directly with the Platonic original. In the above passage, Longus appears to engage with Plato in a critical manner: Richard Hunter has argued that the narrator's 'writing in response to the painting' in fact gives voice to the painting's silence, thus the act tacitly contends with Socrates' claim—again, from the *Phaedrus*—that all writing and painting must remain forever mute.[55] Similar reconfigurations of Plato can be found in other authors of the period such as Plutarch and Maximus of Tyre.[56]

7 Ptolemy's Literary Ambition

Ptolemy's choice of the *Phaedrus* is accompanied by a similar degree of literary ambition. The allusion is more than an inert, merely imitative reference to Plato's madman-lover. It effectively reconfigures not only the expression of the *topos* of the desire for knowledge, but also the very conception of the Platonic lover. Note, first, that Ptolemy signals a figurative turn in the discourse with syntactical and lexical cues. Although ostensibly making Platonic desire the logical result of theoretical activity, Ptolemy renders the main verb of the clause in the potential-optative: 'Since it *may* follow (ἀκόλουθον ἂν εἴη) for one who has theorized on these matters . . . '

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[52]On the Platonic aspects of this opening, see Hunter 1997: 24.

[53]Longus Pr. 2, translation adapted from Reardon 1989: 289.

[54]In Longus' account, for instance, vision prompts desire, whereas for Ptolemy the desire is to see.
[55]Hunter 1997: 28.

[56]See, respectively, Whitmarsh 2001: 47–57 and Tarrant 2000: 133–135.

The effect is to situate the discourse in a hypothetical mood. Moreover, the language of the allusion itself is richly metaphorical, describing both the feeling of desire with an expression of divine love and the discernment of mental abstractions through the activity of beholding. Furthermore, Ptolemy explicitly draws the reader's attention to that latter metaphor, qualifying the verb 'to behold' with an adverbial 'as it were' (ὥσπερ).

This apology for the awkwardness of the visual metaphor is itself important, because it foregrounds the fact that Ptolemy does not simply adduce the madman-lover from the *Phaedrus*, but transforms it. Particularly in Socrates' second speech in the *Phaedrus*, Plato promotes the *spectacle* of beauty and the Forms, communicating his epistemology through metaphors of vision rather than other senses, such as hearing.[57] But the object that the theorist desires to behold is the 'nature of the harmonic power'—an abstraction perhaps more perceptible to the mind's ear. The upshot of Ptolemy's harmonic theory, then, is to reconcile reason and auditory perception: together they ascertain harmonic principles and the beauty manifest in them.[58] Through the allusion to the madman-lover of the *Phaedrus*, Ptolemy fashions his harmonic theory according to a Platonic model but refashions the model at the same time: consequent to Ptolemy's treatment, the beautiful has been made audible to the madman-lover.

Thus Ptolemy has creatively refashioned a memorable component of the *Phaedrus*, but what is most telling about the allusion is what it does not do. Nothing of Ptolemy's literary treatment of the madman-lover is necessary for the larger project of the *Harmonics*. As I noted at the outset, the allusion occurs in a transitional section of second-order discourse: it does not present any theoretical or technical content, nor does it explain such content, but serves only to fashion how the theorist in general (and Ptolemy and his reader, in particular) may feel about that content.[59] The allusion is thus extraneous to the overall presentation of harmonic theory.[60] Instead, it draws comparison to literary practices typical of second-century sophistic culture. Though authorial intentions ultimately lie beyond our grasp, we are left with a strong impression that in presenting the allusion Ptolemy is trying to be *interesting*.

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[57]For the general importance of sight and spectacle to Platonic philosophy, especially as they relate to Plato's wider cultural context, see Nightingale 2004.

[58]Ptol. *Harm.* 1.2.1–31. Cf. Barker 2000: 14–32 and Barker 2010.

[59]In this the allusion is unique in the *Harmonics*. It is also true that Ptolemy adduces another, more general Platonic figure—the 'philosopher' (φιλόσοφος)—into his discussion at 3.5.70, but this is to illustrate further the concept of 'harmonia' (ἁρμονία); see Barker 1989: 377n50. In this passage Ptolemy does not use the philosopher to describe the practice of the theorist.

[60]In this it functions similarly to the 'frame tales' found in later mathematical commentaries that present famous mathematicians (e.g., Euclid) in moralizing episodes. These 'deliver not the [mathematical] knowledge itself, but rather the way a mathematician is supposed to behave when putting the knowledge to practical use' (Asper 2011: 96). A fundamental difference, however, is that Ptolemy is here not morally prescriptive, but emotionally so. He is idealizing the *experience*, not the behavior, of the harmonic theorist.

8   Mathematical Psychologies Prior to Ptolemy?

How comfortably does the expression of the desire for knowledge, Platonizing or otherwise, fit into the generic history of the exact sciences? The evidence surveyed thus far suggests that Ptolemy is unique in this regard: texts from harmonics, astronomy, and mathematics in general were markedly absent from our TLG surveys.[61] That search was restricted to certain defined phrases, of course, thus it will be worth examining the texts themselves to uncover any other expressions that eluded the TLG dragnet. However, any conclusions drawn from direct, textual examination must yet be qualified by the fact that so much evidence is either lost or fragmentary, but even the extant record reveals significant trends in authorial practice. Certain of these already suggest that the negative result of the TLG searches will be further confirmed. Reviel Netz, for instance, has observed an 'inflation of style' in Hellenistic mathematical writing, describing a gradual increase over time in the extent to which mathematical authors position and justify themselves *as authors* amidst a growing tradition of texts.[62] If Netz is generally correct, then we should not expect to find expressions of motivating desires among such earlier mathematical authors as Euclid, Autolycus, and Aristarchus, since such statements are often found in passages of authorial reflection. The second argument concerns the specifically Platonic character of Ptolemy's desire. It has often been observed that Hellenistic mathematical authors, for instance, focused almost exclusively on mathematics, and their writings typically betray little interest in other discursive practices.[63] When they do branch out, it tends to be into certain philosophical pursuits complementary to mathematics, such as astronomy.[64] By this account, Plato's psychology of the madman-lover might seem too far removed from actual mathematics to be of interest to mathematical writers. Taking the above into account, we thus offer two predictions: on the one hand, general claims of a desire for knowledge will only be found as a later development in exact-scientific writing (i.e., in Archimedes and after), if they are found at all; on the other hand, if such claims are made, they will be of a different character than Ptolemy's. The conclusion we shall arrive at generally bears out these predictions: especially in comparison with authors from the Hellenistic period, Ptolemy seems to have done something unique. What, then, do we find among his predecessors?

We begin not with the work of formal mathematicians, but with Ptolemy's early predecessors in harmonics, whom Ptolemy divides into opposing groups: the

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[61]Nicomachus' *Introductio arithmetica* did register the expression σοφίας ὄρεξις (1.2.3), but this text is more a philosophical account of numbers than a presentation of geometric proofs (D'Ooge 1926: 16).

[62]Netz 2009: 92–107.

[63]Netz 1999: 306–311. Cf. Lloyd 1991: 369 and Taub 1993: 152.

[64]There are exceptions: below I examine Hipparchus' 'hybrid' commentary on Aratus. But we especially miss the lost works of the polymathic Eratosthenes, whose nonextant *Platonicus*, for instance, might have offered interesting counterevidence. On this work see Geus 2002: 141–194.

rationalist Pythagoreans and the empiricist Aristoxenians.[65] The Pythagorean harmonic tradition, exemplified by such figures as Philolaus of Croton or Archytas of Tarentum, survives only in fragments. Consequently, any analysis of self-expression in these authors is impeded by the bias of later writers who were more interested in, and thus more likely to record, first-order discussions of doctrine than any second-order statements on motivations. A survey of the fragments bears this out.[66] But we nevertheless do find testimony by Archytas that shows some reflection on harmonic practice: Archytas deems those concerned with 'mathematics' (μαθήματα, surely to be understood quite broadly[67]) to have 'discerned well' (καλῶς ... διαγνῶναι) harmonic phenomena.[68] Note, however, that here Archytas' focus is how those practitioners operate ('well'), not what motivates them to do so. The motivations of those practitioners, as best as we can discern from our fragmentary evidence, are not preserved in the foreground of the text.

The work of Aristoxenus, the foremost proponent and namesake of the empiricist 'school' of harmonics, if not exactly a mathematician, has fared substantially better than that of the early Pythagoreans. Like the rationalists, however, Aristoxenus only reflects on the theorist insofar as method is concerned.[69] Regarding the psychological effects of the study of harmonics, Aristoxenus does note that some believe that 'listening to a discourse on harmonics (ἀκούσαντες τὰ ἁρμονικά) will make them not only experts in music (μουσικοί), but better in character (βελτίους τὸ ἦθος).'[70] But he is highly critical of this position, claiming that such individuals have misunderstood (παρακούσαντες) his statements concerning the limited effect that music itself may have on the hearer.[71] While Aristoxenus thus records a contemporary interest in the psychological effect that even the *theory* of harmonics may cause, he does not endorse it, nor does he specify any role that desire (or something like it) for harmonic theory might play. In any event, he does not promote an image of the harmonic theorist as one driven by a desire for knowledge. As far as our limited, fragmentary evidence indicates, earlier discourses on harmonics offered Ptolemy no positive, formal precedent for his presentation of the theorist.

Let us move on to texts that are more mathematical in form. As predicted above, numerous works in Hellenistic mathematics and mathematical astronomy offer no express characterization of the author or his motivations. These include the earliest of the genre (all those ascribed to Euclid, Autolycus, and Aristarchus), as well as later texts such as Hypsicles' *Anaphoricus* and the astronomical treatises of Theodosius. Their style is almost wholly impersonal, save for the conventional 'I say

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[65]Ptol. *Harm.* 1.2.

[66]See Barker 1989: 28–52.

[67]On the connotations of 'mathematics' and 'mathematician' in antiquity, see Lloyd 2012.

[68]Reported in Porph. *In Harm.* 56.5 Düring.

[69]He is especially interested in defining the proper domain of the science of harmonics: see Aristox. *Harm.* 5.4–6.5 da Rios.

[70]Aristox. *Harm.* 40.14–16 da Rios, translation lightly adapted from Barker 1989: 148.

[71]Aristox. *Harm.* 40.16–41.2 da Rios.1 Cf. Barker 1989: 148n6.

that' (λέγω ὅτι), which is perhaps better understood as part of the formal structure of proof than as the interjection of an authentic, authorial self.[72] In all these the text privileges the presentation of mathematical research over the researcher, and thus there is little that they contribute to the discussion of expressions of desire.

Turning to Ptolemy's mathematical predecessors who evince a more personal style, we find no expression of desire in the terms that Ptolemy uses. Indeed, there are few explicit remarks about that of which desire is the corollary, namely beauty, but that beauty is not what we might expect. Consider how Apollonius of Perga describes certain theorems of the third book of his *Conics*: 'the third [contains] many paradoxical (παράδοξα) theorems . . . of which most and the most beautiful (κάλλιστα) are new' (vol. 1, p. 4 Heiberg). Apollonius does not make explicit what exactly defines those theorems as the 'most beautiful', and in general, Hellenistic mathematical texts do not offer much overt reflection on questions of aesthetics.[73] But consider that Apollonius' superlative, 'most beautiful', qualifies a subset of theorems primarily described as 'paradoxical'. Apollonius here seems to imply that the most beautiful theorems are those that are most paradoxical, thus implying a general aesthetic valuation of the unexpected (and the delight that it may prompt). Netz's recent work develops this notion that the Hellenistic mathematical aesthetic is characterized by surprise and variation, most evident in the narrative structures of mathematical texts, and which refract the 'Callimachean' aesthetic of contemporary Alexandrian poetics.[74] All of this amounts to a conception of beauty that, at least as expressed on the textual surface, is different from the metaphysical beauty exemplified by, say, Plato's Forms, and it is this Platonic conception—and the Platonic language—which Ptolemy adapts in his writings.

Given a beauty exemplified by a non-Platonic aesthetic of surprise and variation, it thus makes sense that mathematicians do not profess to react to it like Plato's eroticized philosophers. We find instead, simply, Hypsicles being 'charmed' (1.12 Stamatis: ἐψυχαγωγήθην)[75] by a problem of Apollonius, with no further comment. Further TLG searches indicate the term itself is a common feature of prose discourse from the Classical period onward; it does not evoke a particular author or text as did Ptolemy's expression. This leads to a general point about the Hellenistic mathematician's attitudes toward his subject: they are sometimes expressed in the text, but only in a passing, unmarked way. For instance, Archimedes, Eratosthenes, and Apollonius occasionally indicate their addressees' or predecessors' zeal for

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[72]Netz 1999: 256.

[73]It is telling that a recent historical survey of mathematical aesthetics passes over Hellenistic mathematics entirely, leaping from Aristotle to Augustine (Sinclair and Pimm 2006: 4–5). On the beauty of mathematical objects in this context, see Netz 2005, esp. 282–283, and the next note.

[74]Netz 2009; cf. Netz 2005 and 2010. For similar studies of a similar aesthetic outside Greek mathematics, see Müller-Hill and Spies 2011: 266–268 and Schattschneider 2006.

[75]By Hypsicles' time, as in our own, a term whose semantics had stretched to include more figurative meanings.

mathematics using cognates of σπουδή, φιλοπονία, and φιλοτιμία.[76] They do not elaborate on these terms, however, nor is the language unique to the mathematical genre. As with cognates of ψυχαγωγία, TLG searches show that such expressions of zeal are common in Greek prose from the fourth century onward.[77] The key point is that Hellenistic mathematicians do register psychological motivations and attitudes in the text, but they *only just* register them. The motivations are presented in such a way that they do not stand out relative to other texts. For Hellenistic mathematicians, then, reactions to mathematics are not in themselves exciting. As Netz has shown, the excitement is to be unveiled—*voilà!*—in the mathematics. An enthusiastic reaction to them almost goes without saying.

Ptolemy is different. But the difference between Ptolemy's attitude and his forerunners' is not simply the expression of *desire*. This becomes clear upon examining the one extant work of Hipparchus, the second-century BCE astronomer whom Ptolemy elevates in the *Syntaxis* as an important predecessor. Hipparchus' *Commentary on the Phenomena of Aratus and Eudoxus* is, of course, several steps removed from mathematics: it is both a commentary on Aratus' hexameter poem, the *Phenomena*, which was based on Eudoxus' astronomical treatise of the same name, and a critique of another commentary on the same poem by one Attalus of Rhodes.[78] But given Hipparchus' importance to mathematical astronomy and to Ptolemy, in particular, it is an appropriate inclusion in the survey. And, as it turns out, an informative one: Hipparchus begins his treatise by addressing one Aischrion as follows: 'From your letter I gladly took note of your continuing propensity toward curiosity (φιλομαθίαν)' (Hipparch. 1.1.1). The theme of his addressee's curiosity or, more literally, his 'fondness for learning', is one that Hipparchus returns to again in the course of the preface, though he does not develop the idea beyond generalizing it, in participial form, to designate his wider readership.[79] The group of those who show commitment to astronomical theory is thus defined by the claim of a shared feeling ('fondness for learning'). This fondness thus functions in Hipparchus' text somewhat differently than zeal did in the mathematical writings surveyed above, in which the latter was always assigned exclusively to individuals. We may observe, on the other hand, that Hipparchus' fondness resembles Ptolemy's desire in two

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[76]σπουδή: Archim. *Method* vol. 2, p. 71, col. 1.33–34 Netz et al.; Apollon.Perg. *Con.* vol. 1, p. 2 Heiberg. φιλοπονία: Archim. *Spir.* vol. 2, p. 2.18 Heiberg; Eratosthenes, at Eutoc. *In Archim. Sph. Cyl.* 90.4 Heiberg (authenticity defended by Knorr 1989: 131–146). φιλοτιμία: Apollon.Perg. *Con.* vol. 2, p. 2 Heiberg. In Toomer's translation of the Arabic copy of *On Burning Mirrors*, Diocles affirms that using gnomons requires 'care' (Toomer 1976: 42), which may have been σπουδή or something similar in the lost Greek original. The letter-form itself seems a natural vehicle to convey this attitude, since authors frequently offer their work expressly as the fulfillment of an eager correspondent's personal request for more mathematics.

[77]The same language even expresses the attitudes that euergetic Hellenistic kings and their subjugated polities show toward one another: see Ma 1999: 191.

[78]On the hybrid form of this work, see Netz 2009: 168–171.

[79]Aischrion's φιλομαθία: Hipparch. 1.1.5; 'those who are fond of learning' (τῶν φιλομαθούντων): Hipparch. 1.1.6, 1.10.25.

ways: first, with respect to the previous point, Ptolemy also described a feeling as the general condition of theorists in the exact sciences (including, we may infer, both himself and his reader); second, simply, Hipparchus' fondness and Ptolemy's desire convey the same basic idea.

Still, there is an important qualitative difference between φιλομαθία and Ptolemy's erotic desire. The former and its cognates, while they may have found their first flowering in the Platonic corpus, are widely found in other philosophical, rhetorical, geographical, medical, and historical authors from the fourth century BCE onward.[80] Thus φιλομαθία seems to be better classified as another species of the 'common' genus of the desire for knowledge. On the other hand, I have argued that Ptolemy's expression entails specifically Platonizing connotations, but it also proves an opportunity for reconfiguring a Platonic concept in a manner typical of second-century literary stylists. Hipparchus' fondness for learning does not really compare.

Ptolemy's desire stands without precedent in the exact sciences through the Hellenistic period. In the early Imperial period we can only grasp blindly for evidence: interest in mathematics did not vanish entirely,[81] but creative mathematical activity appears to have dried up.[82] One important witness survives, however, in Menelaus, an astronomer-mathematician of the late first century CE, apparently active in Rome, whose observations Ptolemy cites in the *Syntaxis*.[83]

Menelaus no longer speaks for himself, however: what remains of his work only survives in the Arabic tradition. Thanks to Abū Naṣr Manṣūr ibn 'Alī ibn 'Irāq, active around the turn of the first millennium,[84] we have essentially a complete translation of Menelaus' *Sphaerica*, a three-book treatise on spherical geometry. In the preface to this work, Menelaus appears to exemplify some of the literary practices described so far. Here I translate Krause's German text into English, referring as well to key phrases transliterated from the Arabic[85]:

> I know what lies in the proofs to make the soul receptive to them, and especially [the part] of those [proofs] in which there is beauty and to which belongs what the soul loves and desires (was die Seele liebt und begehrt: *wa kāna mimmā tuḥibbuhū al-nafsu wa-taštahīhi*). One can, if he loves learning (wenn er Belehrung liebt: *muḥibban li-t-taʿlīmi*), make these things an instrument and build corollary theorems and problems out of them (117–18 Krause).

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[80]The term appears frequently in the *Phaedo* and *Republic*, less so in the *Phaedrus*, *Timaeus*, and the *Laws*. Other Classical and Hellenistic instances include X. *An.* 1.9.5; Isoc. 1.18; Arist. *EN.* 1175a14; Plb. 1.2.8, etc.; Ps.-Scymnus 63; Aristeae.Ep. 1.6; Apollon.Cit. 3.15 Schöne. On its use especially in scientific texts, see Alexander 1993: 59, 100.

[81]This is the period of the philosophizing compiler Nicomachus: see n. 61 above. Cf. Cuomo 2000: 9–56 on the public profile of mathematics in the first centuries CE.

[82]This is the period Netz 1999: 284 describes as 'a wilderness between two deserts'.

[83]*Syntaxis* part 2, pp. 30 and 33 Heiberg; apparently the same Menelaus is present for the dialogue in Plutarch's *De facie* (930a).

[84]See further Krause 1998: 109–111.

[85]I am grateful to Alexander Key for his expertise and assistance on points of Arabic philology, which emerge in the following paragraphs.

Philological methods can only penetrate so far through layers of translation, but here I make a few observations. It seems clear that some form of the desire for knowledge underlies the phrase 'if he loves learning', and we can even offer a plausible reconstruction. The root of the verb *muḥibban*, *ḥbb*, typically denotes a generic, unmarked kind of love, consistent with the Greek root φιλ-; more emphatic expressions are often built on the root *š-h-y*, such as we find in the foregoing description of the soul's 'desire' (*wa-taštahīhi*). It seems a reasonable conjecture, then, that Menelaus' original expression featured some cognate of φιλομαθία. Indeed, we find that the Arabic translation of Aristotle's *Nicomachean Ethics* 1175a14, roughly contemporary with Abū Naṣr,[86] renders ὁ φιλομαθής as *al-muḥibb fī 't-ta'līm*, [87] a phrase almost identical to Abū Naṣr's expression.[88] The difference seems due simply to the definite article, present in Aristotle's text and plausibly lacking from Menelaus'. For the latter, it is easy to imagine either a participial or adjectival cognate of φιλομαθία, perhaps in the dative case as part of an impersonal construction. It seems clear enough, then, that Menelaus' theorist of spherical geometry should feel a desire for knowledge—but was it a Platonizing desire?

This is harder to ascertain, but some plausibility lies in the expression of '[the part] of those [proofs] in which there is beauty and to which belongs what the soul loves and desires (was die Seele liebt und begehrt: *wa kāna mimmā tuḥibbuhū al-nafsu wa-taštahīhi*)'. Krause noted that the account of beauty and the loving and desiring soul features Quranic overtones.[89] This probably does not indicate an interpolation by Abū Naṣr, but it could be an instance of an artful and learned translator seizing an opportunity to draw his source material closer to a work of high cultural value. But the very same elements, if found in the Greek, would fit well in a Platonizing expression, and the language calls to mind the *Phaedrus*. The first-century CE Menelaus is active within the period when we expect this to occur, and if the expression 'loves and desires' faithfully transmits a duplex structure in Menelaus' original, it is again plausible that one of those terms might have been a cognate of ἔρως (though other Greek terms of 'desire' could just as well have comprised the original). It is at least a possibility, then, that in the *Sphaerica*, Menelaus featured a Platonizing expression for the desire for knowledge. Ptolemy is perhaps then neither the only nor the first author in the exact sciences to exemplify such passion. Lacking Menelaus' Greek, we cannot determine whether he likewise might have anticipated Ptolemy in creatively refashioning his source material. Even without that final flourish, however, the evidence of Menelaus encourages us to speculate that in the Imperial period, and in contrast to generic

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[86]The extant manuscript is itself dated 1222 CE, but the translation apparently dates to the ninth or tenth century: see Akasoy and Fidora 2005: 1–2.

[87]Akasoy and Fidora 2005: 544n91.

[88]Does this indicate a convention shared among translators for rendering φιλομαθ- into Arabic?

[89]Krause 1998: 117n5.

precedents, the mathematical sciences kept pace with contemporary prose genres by conceptualizing theoretical motivations according to a Platonizing aesthetic.

9 Ptolemy's Timely Desires

In drawing this paper to a close, let us consider what insights we have gained through our examination of Ptolemy's desire for knowledge. That the desire for knowledge is fundamental to human nature? This much was assumed at the outset. Heisenberg could have been just as certain that Ptolemy, like Einstein, must have felt something that moved him toward mathematical investigations, and I can make no claim to revealing anything new about Ptolemy's psychology unless I should first prove or disprove his humanity. But what was the 'something' that Ptolemy felt? There should be no surprise at the basic fact that expressions of the desire for knowledge are shaped by culture; in this it is a desire like any other. But I hope to have shown in this essay that the shapes themselves are significant and invite philological and historical analysis. Heisenberg confesses his 'attraction': this is the expression of desire as an impersonal force at perhaps its utmost demystification, a mere 'drawing towards', even when its object is beauty. Is it a sign of Heisenberg's times? He is certainly no second-century Platonizer 'in the grip of a divine Eros'. In the expression of psychological motivations, then, we find one salient difference (among many) between Heisenberg and Ptolemy. I have argued that similar differences, traced along generic and chronological lines, prevailed in Greek literary culture from the Classical period through the Imperial, and have explicated how some of these differences were significant. Focusing on Ptolemy, I examined the manifestation and significance of the Platonizing expression of the desire for knowledge in Imperial literary culture, and how the forms and processes of creative reconfiguration it entails serve as points of continuity between exact-scientific works and texts in other prose genres. In doing so, I promoted a view of Ptolemy, in particular, as something of a prose-stylist. This paper began by considering Ptolemy's apparent isolation from his wider culture, and now it closes by qualifying that isolation: Ptolemy's activity in a specialized genre may have been directed toward and received by a specialized readership, but the motivations he expresses for engaging in that activity and the creative manner in which he expresses them are nevertheless founded in the wider literary culture of his time.

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