

The Reception of Ptolemy's *Harmonics* in the Byzantine Manuscript Tradition

This paper contributes to the exploration of the multi-faceted role of music — social, scientific, and ludic — in late antiquity and Byzantium. In particular, this paper concentrates on the reception of Ptolemy's *Harmonics* in the Byzantine manuscript tradition. This text provides a foundation for the theoretical discussion of music, in particular by providing a mathematical and philosophical framework for tuning systems (how pitches reflect musical intervals). I begin by situating the *Harmonics* within Ancient Greek philosophy and musical theory. In particular, I sketch the philosophical world in which this treatise was situated, already part of a rich tradition of speculation on the natural world and the nature of the divine, employing both empirical observation and tools of reason like logic and mathematics. I then indicate the structure and content of the *Harmonics*, as a synthesis of the Pythagorean theoretical tradition of music theory and the Aristoxenian empirical tradition. I turn to the first great commentator on the *Harmonics*, Porphyry, to situate this literate, learned tradition within the broader spectrum of activities that constitute music-making. The core of the paper is my subsequent identification of the manuscripts through which the *Harmonics* was transmitted in the twelfth- to fourteenth-century Byzantine Empire. As we will see, most of these manuscripts were indeed brought from Constantinople to Italy as part of the broader movement now called “humanism.” But it is important to stress that these treatises were also part of a rich tradition in late Byzantium that stands between the world of late antiquity in which authors like Porphyry wrote and the world of Italian humanism where these texts were “received.”

Philosophical Background for Ptolemy's *Harmonics*

Plutarch preserves a fragment from one of Aristotle's lost works, *Eudemus* or *On the Soul*, that is indicative of Ancient Greek philosophers' approach to music:

ἡ δὲ ἁρμονία ἐστὶν οὐρανία τὴν φύσιν ἔχουσα θεῖαν καὶ καλὴν καὶ δαιμονίαν· τετραμερῆς δὲ τῇ δυνάμει πεφυκυῖα δύο μεσότητας ἔχει ἀριθμητικὴν τε καὶ ἁρμονικὴν, φαίνεται τε τὰ μέρη αὐτῆς καὶ τὰ μεγέθη καὶ αἱ ὑπεροχαὶ κατ' ἀριθμὸν καὶ ἰσομετρίαν· ἐν γὰρ δυσὶ τετραχόρδοις ῥυθμίζεται τὰ μέρη.

Harmonia is heavenly, and its nature is divine, beautiful and marvelous. It is fourfold in its natural power, and thus has two means, the arithmetic and the harmonic, and its parts and magnitudes and excesses are displayed in conformity with number and with equality of measure; for melodies acquire their structure within two tetrachords. (Plutarch, *De Musica*, 1139B)¹

Today, we often understand music to be some arrangement of sounds and practices relating to the production of sound that are constitutive of meaning, understood both semiotically and socially. The kind of music Aristotle is concerned with, and Ptolemy after him, refers to just one part of this broader phenomenon we call “music”: namely, harmonics. As Andrew Barker writes,

It is abundantly clear that the object whose praises Aristotle is singing, and which he describes explicitly as beautiful, *καλός*, is not ‘music’ in the usual sense of the word, but the skeletal framework that sets in place the fundamental elements of a musical scale, just the bare bones upon which the flesh and blood of a composition may be hung, but in whose

¹ The Greek text is cited from V. Rose, *Aristotelis qui ferebantur librorum fragmenta* (Leipzig: Teubner, 1886), printed as *Eudemus* fragment 47. Translation by Andrew Barker, quoted in Andrew Barker, “Mathematical Beauty Made Audible: Musical Aesthetics in Ptolemy's *Harmonics*,” *Classical Philology* 105, no. 4 (October 2010): 403, <https://doi.org/10.1086/657028>. The lost work is also mentioned (but not quoted) by Diogenes Laertius in his list of Aristotle's works: *Lives and Opinions of the Eminent Philosophers*, V.12.

absence nothing will be music.²

“Harmonics,” although technically the accurate translation, is also a misleading description of the subject of these ancient treatises, since they are not concerned with “harmony,” which as we understand it today is an invention of the Baroque period of Western classical music.³ Rather, “harmonics” provides an analysis of the elements and structures that make up melody, what we would today call “modes” or “scales” — though both of these are imprecise translations for what is perhaps better expressed by Andrew Barker’s term “patterns of attunement.”⁴

Furthermore, harmonics itself is primarily mathematical and philosophical: these “patterns of attunement,” features of the natural world, are approached through the tools of reason, *logos* (for Aristotle, in particular, the syllogism). We can use mathematics and logic to distinguish and explain which patterns of attunement are harmonious (“divine, beautiful and marvelous,” as Aristotle said) and which discordant. Thus, harmonics provides the intellectual scaffolding for what our ears hear as musically fundamental. As in other areas of philosophy, it is philosophical and mathematical analysis that provides clarity by revealing the true nature of our initial experience of wonder at the natural world.

² Ibid., 404.

³ The word “harmony” remained the same, although its sense shifted from earlier more general “concord” or “agreement,” both musical and non-musical, to refer to the specific science of counterpoint, which is strictly the speaking the combination of multiple melodies so as to form chords and chord progressions according to strict rules that reached its perfection under Bach. Thus, for instance, Carl Dahlhaus writes: “In Greek music, from which derive both the concept and the appellation, ‘harmony’ signified the combining or juxtaposing of disparate or contrasted elements – a higher and a lower note. The combining of notes simultaneously was not a part of musical practice in classical antiquity: *harmonia* was merely a means of codifying the relationship between those notes that constituted the framework of the tonal system. In the course of history it was indeed not the meaning of the term ‘harmony’ that changed but the material to which it applied and the explanations given for its manifestation in music.” Carl Dahlhaus, “Harmony, §1: Historical definitions,” in *Grove Music Online* (2001), accessed 23 December 2022 at <https://doi.org/10.1093/gmo/9781561592630.article.50818>

⁴ Andrew Barker, “Greek Musicologists in the Roman Empire,” *Apeiron* 27, no. 4 (January 1994): 55, <https://doi.org/10.1515/APEIRON.1994.27.4.53>.

I will make this philosophical point perhaps pedantically clear through an explicit musical example.⁵ The basic interval in music is the octave — two notes that sound “the same,” just at different pitch levels, making the most well-blended sound possible when struck together and forming natural starting and ending points for a melody. The reason we might have some justification in calling this “natural” is that the two notes stand in the simplest possible ratio of 2:1, such that the higher pitch has exactly double the frequency of the lower pitch. For instance, the standard A in Western music is now designated as 440 Hz; its counterpart one octave higher would be at 880 Hz. To put it in visual terms, every other peak of the waves of the second note coincides exactly with every peak of the former. Hence why the “octave,” the name we give to a ratio of 2:1 in music, is often seen (or better, heard) as the fundamental interval in music, and thus a “natural foundation” for music theory.

The two other “fundamental” intervals are the fifth and the fourth. These correspond to the frequency ratios 3:2 (e.g. 660 Hz : 440 Hz) and 4:3 (e.g. 587 Hz : 440 Hz) respectively, or waves where every second or third peak coincides. In Western musical theory today, we understand the fifth and the fourth together to make up an octave: in other words, if you go from C to G, up five white keys on the piano, and then from G to C, up four more keys, you will have traversed 8 keys, an octave. This corresponds to a basic mathematical relation of the frequency ratios:

$$\frac{3}{2} \times \frac{4}{3} = \frac{2}{1}$$

Because adding intervals is multiplying their ratios, we find that the ratio of a fifth and a fourth added together make the ratio of an octave.

These pitch relationships are features of the natural world that should be accounted for by philosophy. The perennial philosophical question is how an accident like “beauty” is

⁵ I am following here the useful explanation in Martin West, *Ancient Greek Music* (Oxford: Clarendon Press, 1992), 8–12.

related to these sounds, which we might understand as just waves of compressed air at particular frequencies. Does the “beauty” or “concord” of these sounds come about because of their participation in a universal form (Plato)? Is it something rather that lies in the things themselves, in accord with laws that humans can use reason to discover (Aristotle)? Is the “beauty” of these intervals just a projection of the human mind? Is beauty a category, part of our mind, that we cannot help but understand music through, thus neither properly ideal nor empirical (Kant)? It is questions like these that harmonics, treatises in ancient music theory, wished to approach, by bringing together what we today call mathematical physics, philosophy, and music theory proper. Thus Aristotle writes in the *Posterior Analytics* (78b–79a) that harmonics according to hearing, ἀρμονικὴ ἢ κατὰ τὴν ἀκοήν, draws to our attention phenomena whose task it then is for harmonics according to mathematics, ἀρμονικὴ ἢ μαθηματικὴ, to explain; while Plato writes in the *Timaeus* (80b) that the consonance of sounds due to regularity (φθόγγοι ... δὲ ξύμφωνοι δι’ ὁμοιότητα) comes about because of their “imitation of divine harmony in mortal movements,” διὰ τὴν τῆς θείας ἀρμονίας μίμησιν ἐν θνηταῖς γενομένην φοραῖς παρέσχον.⁶

Ptolemy’s *Harmonics*

This is the philosophical background against which Ptolemy wrote his *Harmonics* almost half a millennium later, around 100 CE. Ptolemy sets out to account for relationships of sound that are at once empirical, which is to say acoustic, and theoretical, which is to say philosophical or mathematical. In addition to the philosophical approach described above, which is broadly called the “Pythagorean” or “Platonic” school of harmonics, Ptolemy referred also to the more empirical harmonics of Aristoxenus, a Peripatetic of the fourth century BCE for whom “the laws of melody are its own, not borrowed from the wider sphere

⁶ For discussion of these passages, see Barker, “Mathematical Beauty Made Audible,” 404–5.

of mathematics or physics or anything else.”⁷ Ptolemy’s *Harmonics* is a synthesis of these two schools. As Lukas Richter writes, “Ptolemy’s basic postulate was that the two criteria of judgment or reason and empirical observation should not contradict each other.”⁸ This principle of reconciliation guides the primary divisions of the *Harmonics*, which are as follows:

- the theory of harmonics (i.1–2);
- the principles of acoustics (i.3–4);
- the theory of intervals (i.5–11);
- the theory of the genera (i.12–ii.1);
- a description of the helicon, a geometrical instrument (ii.2);
- the theory of the fourth, fifth and octave species (ii.3);
- the Perfect System and the derivation of modes by transposition or modulation (ii.4–11);
- a description of the monochord (ii.12–13);
- tables of the genera and the “mixtures” usual in practice (ii.14–15);
- the use of the 15-string “monochord” (iii.1–2);
- comparisons of the relationships between notes and the parts of the human soul (iii.3–7) and between the heavenly bodies, with tables (iii.8–16).

In order to reconcile fallible sense perception and mathematics, Ptolemy relied extensively on an instrument, the monochord. As Richter writes, “Believing sense perception to be fallible, he discovered in the monochord, which enables acoustic phenomena to be expressed in visual, geometric terms, a precise scientific instrument by which to measure the numerical

⁷ Barker, “Greek Musicologists in the Roman Empire,” 56.

⁸ Lukas Richter, “Ptolemy,” in *Grove Music Online* (2001), accessed December 10, 2022, <https://doi.org/10.1093/gmo/9781561592630.article.22510>

ratios of consonances.”⁹ There is a similarity here to Ptolemy’s work in the *Almagest*, which relied on his access to an observatory in Alexandria for its observations of planetary movements.

For Ptolemy, empirical observation is given a more positive role to play, even though reason is still the faculty that can explain concord to us. Devices like the monochord are essential for bridging the gap between sense and reason. Ptolemy makes this point by drawing an analogy with the compass, a tool that allows us to make a more perfect circle than we ever could with our hands alone. Ptolemy writes:

ὥσπερ οὖν ὁ μόνῃ τῇ ὄψει περιενεχθεὶς κύκλος ἀκριβῶς ἔχειν ἔδοξε πολλάκις, ἕως ἂν ὁ τῷ λόγῳ ποιηθεὶς εἰς ἐπίγνωσιν αὐτὴν μεταγάγοι τοῦ τῷ ὄντι ἀκριβοῦς, οὕτω κἂν μόνῃ τῇ ἀκοῇ ληφθῆ τις ὠρισμένη διαφορὰ ψόφων, δόξει μὲν εὐθὺς ἐνίοτε μήτε ἐνδεῖν τοῦ μετρίου, μήτε ὑπερβάλλειν, ἐφαρμοσθείσης δὲ τῆς κατὰ τὸν οἰκεῖον λόγον ἐκλαμβανομένης ἀπελεγχθήσεται πολλάκις οὐχ οὕτως ἔχουσα, τῆς ἀκοῆς ἐπιγινωσκούσης τῇ παραθέσει τὴν ἀκριβεστέραν ὥσανεὶ γνησίαν τινὰ παρ’ ἐκείνην νόθον.

Just as a circle constructed by eye alone often appears to be accurate, until the circle formed by means of reason brings the eye to a recognition of the one that is really accurate, so if some specified difference between sounds is constructed by hearing alone, it will commonly seem at first to be neither more nor less than what is proper; but when there is tuned against it the one that is constructed according to its proper ratio, it will often be proved not to be so, when the hearing, through the comparison, recognizes the more accurate as legitimate, as it were, beside the bastardy of the other. (*Harmonics* i.1.26–28)

Let me explain this passage. We can draw a circle with our hands, and we can use our eyes to judge how good of a circle it is. But our eyes can be mistaken, even if we employ our faculty of reason, in this case our knowledge of geometry. To avoid judging wrongly, we should

⁹ Ibid.

employ a tool, the compass, that can draw a really perfect circle next to which we can judge our own attempt. Similarly, we can use our ears to tune our lyre so that two parallel strings sound a perfect fifth. We use our ears (trained ears) to judge the success of this tuning. But to be accurate in our tuning, we need to use a device, in this case the monochord, that can make audible the mathematical ratios so as to aid our senses. As Andrew Barker writes, commenting on this passage:

When we are dealing with musical intervals we shall need acoustic counterparts of the compasses, gadgets that can display specified intervals to our ears in the form that mathematical reason assigns to them; these are the monochord and the various more complicated instruments that Ptolemy describes later in the *Harmonics*. Reason discovers exactly what must be done to a line if it is to describe a circle and what must be done to a pair of sounds if they are to stand in the relation of a perfect fourth, and the practical devices allow us to lay out the rationally constructed figure or interval in front of our eyes or our ears. Then, Ptolemy asserts, our senses will unfailingly recognize the superiority of the rationally constructed example over the imperfect specimen that had previously satisfied it.¹⁰

What Ptolemy thus accomplishes is not just a synthesis of philosophical and rational approaches to harmonics, which is to say a reconciliation of the Pythagorean tradition stretching back to Plato and Aristotle and the empirical tradition of Aristoxenus. It is also to bring reason back to earth. No longer is harmonics a pursuit of philosophers gazing in wonder at divine *harmonia* or mathematicians busy with ratios, not affected by or affecting the music played in theaters and symposia from Athens to Alexandria. The monochord shows how reason practically affects the making of music via tuning, like how the compass makes the theoretical science of geometry practically relevant for construction and visual art.

¹⁰ Barker, "Mathematical Beauty Made Audible," 415.

We are thus already in the realm of reception, or more generally situating the theoretical science of harmonics within the practice of music. We should remember that Ptolemy spent his career in Alexandria, sometime between 83 and 161 CE. In addition to the observatory Ptolemy probably used, the city was also home to a great library and many outstanding scholars (for instance, the Alexandrine grammarians). Alexandria was also home to much more than intellectual life. Andrew Barker calls the city “music-mad,” and it was home to many different cultural practices, from Near Eastern myths to Egyptian gods to Jewish cantillation to, yes, Greek philosophy. While harmonics like Ptolemy’s was certainly a primarily scholarly practice, referring back to the four-hundred-year-old tradition of writers like Plato, Pythagoras, and Aristoxenus, it was situated within a form of everyday life that had continued to evolve, and undoubtedly included much music, too.

Porphyry’s Commentary on the *Harmonics*

Ptolemy’s first great commentator was Porphyry, who was born in Tyre in 234 CE. Porphyry studied under Plotinus the neoplatonist and Longinus the rhetorician (who gave him his name, according to Eunapius) in Athens before going to Rome, where he was “recognised as the leading figure among Plotinus’ followers and as the foremost philosopher in the city” before his death around 304 CE.¹¹ In the commentary on the *Harmonics*, Porphyry remains largely faithful to Ptolemy. Barker writes that “he treats Ptolemy with much the same kind of respect as was given to the founder of a school by its adherents.”¹² Thus, we see again concern both for the particulars of music and significant philosophical reflection on subjects of epistemology and ontology, such as rationalism vs. empiricism (as manifested in the

¹¹ Andrew Barker, *Porphyry’s Commentary on Ptolemy’s Harmonics: A Greek Text and Annotated Translation* (Cambridge: Cambridge University Press, 2015), 2.

¹² *Ibid.*, 10.

opposition between Pythagoras/Plato and Aristoxenus) and the role of various mental faculties in understanding of phenomena like music.

What prompts the writing of a commentary like Porphyry's on the *Harmonics*? We do not want to generalize too much from one text. But clearly music theory of this sort was valued. Barker cites William Johnson's *Readers and Reading Culture in the High Roman Empire* to suggest that the commentary was probably developed as part of a "close-knit group of intellectuals," which played a sociological role through "the legitimacy of their claim to the elite status that membership of the group conferred."¹³ In my view, emphasizing such a sociological role is helpful in understanding the place of music in this society. That is not at all to deny that there is a strong scientific, philosophical purpose to harmonics. But we ought to remember that music plays multiple roles simultaneously, of which we may name three: (1) sociological, indicating or conferring status and identity; (2) theoretical, engaged in a philosophical study of and theorization about the natural world; and (3) ludic — in other words, music is an object of politics and theory but is always much more than that, too.

The writing of Aristides Quintilianus, who sometime between the second and fourth centuries CE authored a synopsis of ancient musical writing, is indicative of this latter function of music:

οὐκ οὐκ ἔνεστι πρᾶξις ἐν ἀνθρώποις ἥτις ἄνευ μουσικῆς τελεῖται. θεῖοι μὲν ὕμνοι καὶ τιμαὶ μουσικῆ κοσμοῦνται, ἑορταὶ δὲ ἴδια καὶ πανηγύρεις πόλεων ἀγάλονται, πόλεμοι δὲ καὶ ὁδῶν πορεῖαι διὰ μουσικῆς ἐγείρονται τε καὶ καθίστανται· ναυτιλίας τε καὶ εἰρεσίας καὶ τὰ χαλεπώτατα τῶν χειρωνακτικῶν ἔργων ἀνεπαχθῆ ποιεῖ τῶν πόνων γινομένη παραμύθιον. παρὰ δὲ τισὶ τῶν βαρβάρων κὰν τοῖς κήδεσι παρείληπται τῆς κατὰ τὸ πάθος ἀκρότητος τῆ μελωδία παραθραύσουσα. καὶ μὴν οὐκ ἀπὸ μιᾶς ἡμᾶς αἰτίας ἑώρων εἰς τὸ μελωδεῖν τρεπομένους ἀλλὰ τοὺς μὲν ἐν εὐθυμίαις ὑφ' ἡδονῆς, τοὺς δ' ἐν ἀχθηδόσιν ὑπὸ λύπης, τοὺς

¹³ Ibid., 46.

δὲ ὑπὸ θείας ὀρμῆς καὶ ἐπιπνοίας κατεχομένους ὑπὸ ἐνθουσιασμοῦ.

No human activity is complete without music. Music beautifies hymns to the gods, and their worship; it brings good cheer to private celebrations and public festivities; it gives vigour and support to those at war or on journeys; it takes away the hardship from sailing and rowing, and from the hardest kinds of manual labour, easing their toil; and among some foreign peoples it is used even in mourning, where it blunts with melody the sharpness of grief. It has also been observed that there is no one single cause that makes us turn to making melody. For those who are happy it is pleasure, for those in sorrow it is grief, and for those possessed by the impulse of a divine breath it is inspiration. (ii.4.56–63)¹⁴

I take this quotation to indicate the rich and varied role music played in antiquity, as it does today. Music is played, practiced, and lived, not just theorized and analyzed. But to put it in this way is to make too much of a dichotomy between theory and practice in the first place. Philosophy, too, especially in the Hellenistic and Imperial world, was a way of life, not just a science. Commentaries like Porphyry's and summaries like Aristides' are not just learned treatises written in a tower by an ascetic poring over earlier texts, but also social phenomena, coexisting with these literary practices. Commentary traditions are forms of life, too. The various strands interweave and interact: Ptolemy's treatise refers to Plato and Aristotle, but also gives practical instructions on tuning that themselves reflect habits of the ear, ways of hearing sound as variously harmonious and discordant.¹⁵

¹⁴ Translation in Andrew Barker, ed., *Greek Musical Writings: V. 2. Harmonic and Acoustic Theory* (Cambridge: Cambridge University Press, 1989), 462. For more on Aristides see Frieder Zaminer, s.v. "Aristides" in *Brill's New Pauly*.

¹⁵ One might say with Pierre Hadot, later Michel Foucault, and still later Lorraine Daston and Peter Galison (*Objectivity* [New York: Zone Books, 2007]), that these are all practices of the self, configured as both the knowing subject of epistemology and the behaving subject of ethics. But there are worries about this approach to antiquity that I will register but not deal with here. See, for instance, James I. Porter, "Foucault's Ascetic Ancients," *Phoenix* 59, no. 1/2 (2005): 121–32., who writes that "the promissory note of self-fashioning is a tall order indeed. It is also (I believe) a barely coherent concept that probably tries to explain too much all at once: pagan and postmodern subjectivities; the contingency of all of history; historical change, conceived as rupture (by claiming that contingency somehow releases subjects from necessity); the artfulness of identity (which leaves wide open the question of how to decide *which kind or genre of art* identity is meant to embody); the

Ptolemy's *Harmonics* in the Manuscript Tradition

I have spent time on Porphyry's Commentary on the *Harmonics* not simply because it provides a well-documented example of the reception of the *Harmonics* and thus an indication of what studying it can tell us about music. Porphyry's commentary is also one of the texts transmitted alongside Ptolemy's *Harmonics*. For instance, one of the main texts relied on by Düring for his edition of Ptolemy is Vaticanus graecus 187 (14th century), which contains the *Harmonics* in folios 1 to 71 and Porphyry's commentary in folios 82 to 162.¹⁶ The main class of manuscripts that are sources for Porphyry's Commentary on the *Harmonics* is edited by Nicephorus Gregoras in the fourteenth century. Again, Vaticanus Graecus 198, a good example, includes Ptolemy's *Harmonics* alongside a variety of commentaries on Ptolemy, many by Neoplatonists like Aristeides Quintilianus and Porphyry.¹⁷ These manuscripts, in my opinion, should be seen in the tradition I have sketched stretching from Plato and the Pythagoreans to Ptolemy to Porphyry and beyond. There was no clear break in this tradition, which was always already referring to ideas, practices, and figures of the past. Neoplatonism, music as an everyday practice, and the theory of sounds and mathematics were common features of this landscape, features that we can imagine reappearing as the centuries proceeded and scholars continued to copy and comment on these texts, and as the music that was played and heard also evolved.

Next, I will dive a little deeper into these Byzantine manuscripts, focusing on which manuscripts between the 12th and 14th centuries transmit the *Harmonics*. In each case, I will identify which other texts identify it, noting who the people are who wrote these accompanying texts and who the people are who copied and preserved the manuscripts. As

history of sexuality *and* the history of subjectivity (while often leaving uncertain which of these two histories is in focus at any given moment)."

¹⁶ As indicated in the *Pinakes* entry at <https://pinakes.irht.cnrs.fr/notices/cote/66818/>

¹⁷ See <https://pinakes.irht.cnrs.fr/notices/cote/66829/>

we will see in due course, these figures continue to be by and large learned men, often associated with the church and the court in Constantinople. This makes sense; we might remember that even today, it requires a great deal of schooling (and therefore, time and class privilege) to (a) read at all; (b) read classical or classicizing Greek; and (c) understand enough philosophy and mathematics to make sense of what they are reading. Tracing the source history of these manuscripts is thus also tracing the social history of education and the intellectual history of the expanding, contracting, and intersecting circles of learned people. But this history should not be divorced from what we can imagine as the larger story of music (of thought and of feeling) and society. Music is at once a very learned practice of theoreticians and philosophers and a very ordinary activity of play and feeling. Still, the manuscripts provide a solid ground on which to stand for writing some of this history.

First, a note: none of the musical texts of antiquity, with the only exception being Aristoxenus' *Rhythmic Elements*, survives in any manuscript older than the 11th century CE. As Thomas Mathiesen writes:

The extent to which these later copies preserve the form and content of any of the treatises is, in general, impossible to determine, and it cannot be established for certain whether the titles or even the authors assigned to the treatises in the manuscripts represent the actual authors and titles at the time the treatises were first composed.¹⁸

In other words, we should not naively assume that the texts we find in these manuscripts reproduce some original treatise. As we have already seen, treatises like Porphyry's were already part of a vibrant scholarly commentary tradition in which texts were constantly reworked and quoted liberally (even to the point of what we would today call plagiarism). There is no *end* to this tradition, and thus no break after which manuscripts are just neutral containers for the transmission of older texts. Hence why it is vital to take note of how the

¹⁸ Thomas Mathiesen, "Greece §II: Ancient" in *Grove Music Online*.

manuscripts we find are, quite literally, composed: under what conditions they are copied and/or compiled out of earlier disparate parts.

The *Pinakes* database lists 107 Greek manuscripts that contain Ptolemy's *Harmonics*. Of these, 64 (60%) are from the 16th century or later.¹⁹ I will exclude these, with one exception noted later. There are 19 manuscripts from the 13th and 14th centuries, which I will focus on here.²⁰ In addition, the earliest manuscript dates to the 12th century. (1) This is currently held in Venice at the Biblioteca Nazionale Marciana as gr. VI. 010. This manuscript begins with Ptolemy's *Harmonics* followed by other musical treatises: Plutarch's *De Musica*; Porphyry's commentary; Aristides Quintilianus; and various other manuscripts of musical treatises, many anonymous.²¹ (2) The next oldest manuscript, from the second half of the 13th century, is from the Vatican, Pal. Gr. 095, purchased by Ulrich Fugger in 1564 and held until 1623 in Heidelberg, when it was taken to Rome as war spoils.²² Unlike the earlier manuscript, in this one the *Harmonics* is followed by fragments from Diophantus on mathematics and then Euclid's *Elements*. In addition, the margins include various calculations and mathematical figures in the margins.²³ This seems to identify the *Harmonics* as a mathematical more than musical text.

There are three more manuscripts from the 13th century, all held at the Vatican Library. (3) The first, Vat. Gr. 186, includes Plutarch and Porphyry after Ptolemy, plus a commentary on Ptolemy's *Harmonics* by Pappus Alexandrinus.²⁴ Furthermore, this text has many marginal notes, which appear to my untrained eye to be musical.²⁵ I would thus suggest

¹⁹ See the list at <https://pinakes.irht.cnrs.fr/notices/oeuvre/id/6752>

²⁰ I have also included two manuscripts from the 15th century. I have numbered the manuscripts in this section according to their appearance in my text for ease of reading.

²¹ See <https://pinakes.irht.cnrs.fr/notices/cote/id/70516>

²² See https://digi.ub.uni-heidelberg.de/de/bpd/virtuelle_bibliothek/codpalgraec/beschreibungen/bav_pal_gr_95.html

²³ "In allen Schriften erscheinen am Rand jeweils Berechnungen und mathematische Figuren." See https://digi.ub.uni-heidelberg.de/de/bpd/virtuelle_bibliothek/codpalgraec/beschreibungen/bav_pal_gr_95.html

²⁴ See <https://pinakes.irht.cnrs.fr/notices/cote/id/66817>

²⁵ See the digitization at https://digi.vatlib.it/view/MSS_Vat.gr.186

that Vat. Gr. 186 is a more musical compendium than the more mathematical Pal. Gr. 095. (4) Vat. Gr. 191 contains many more texts, musical, mathematical, and beyond, over 400 folios. The copyist for these is identified as Ioannes Pothos Pediasimos (Ἰωάννης Πόθος Πεδιάσιμος) and the first owner was Manouel Chrysoloras (Μανουήλ Χρυσολοῤῃς), a professor of Greek in Florence from 1397 to 1400.²⁶ It was then owned by Isidore, Metropolitan of Kiev and all Russia from 1436 to 1458 and Latin Metropolitan of Constantinople from 1458 to 1463, and a supporter of the Council of Ferrara–Florence as one of the six chief speakers on the Byzantine side.²⁷ (5) The last 13th-century manuscript, Vat. Gr. 192, is said to have come from the collection of Pope Nicholas V, presumably one of the manuscripts rescued by him during the fall of Constantinople.²⁸ This manuscript would then be exemplary of the humanist concern for Greek letters. The manuscript contains four of Euclid’s treatises, one each by Damianus, Hypsicles, Geminus, and Aristarchus, and what we can by now understand to be a standard complement of musical treatises: Ptolemy, Plutarch, Aristides Quintilianus, and Theon Alexandrinus. My eye is very untrained, but it seems to me like these were copied by different hands at different times and only assembled later, which would make sense if the manuscripts were salvaged by Nicholas V or another Italian humanist from Constantinople.²⁹

Now on to the 14th-century manuscripts. (6) The manuscript at the Spanish Real Biblioteca, Γ. IV. 08 (Andrés 196), contains Aristides Quintilianus, Ptolemy’s *Harmonics*, and scholia on Aristotle’s *Analytics* by Ioannes Pothos Pediasimos, who we met earlier as the copyist for Vat. Gr. 191.³⁰ (7) The manuscript in the Biblioteca Medicea Laurenziana in

²⁶ See <https://pinakes.irht.cnrs.fr/notices/cote/id/66822>

²⁷ See Aristeides Papadakis, s.v. “Isidore of Kiev,” in the *Oxford Dictionary of Byzantium* (2005), ed. Alexander Kazhdan, accessed 23 December 2022 at <https://www.oxfordreference.com/display/10.1093/acref/9780195046526.001.0001/acref-9780195046526-e-2523>

²⁸ See <https://pinakes.irht.cnrs.fr/notices/cote/id/66823>

²⁹ See https://digi.vatlib.it/view/MSS_Vat.gr.192

³⁰ See <https://pinakes.irht.cnrs.fr/notices/cote/id/14636>

Florence, Plut. 58. 29, contains many Byzantine texts, by e.g. Michael Psellus, as well as Ptolemy's *Harmonics*, Porphyry's commentary, and Plutarch's *De Musica*.³¹ The manuscript comes from the Monastery of Kosinitza, in Drama near Serres in Macedonia. (8) The manuscript III C 03 from the Biblioteca Nazionale Vittorio Emanuele III contains various musical manuscripts, including Porphyry and Plutarch as well as Ptolemy.³² III C 03 was originally part of the same manuscript as (9) III C 04, which contains more harmonics, namely Dionysius and Aristides Quintilianus, as well as Ptolemy and others such as Manuel Bryennius and Bacchius Geron.³³ (10) There is also one manuscript from the Biblioteca Ambrosiana in Milan, L 112, which contains Ptolemy and Bryennius.³⁴ (11) The other manuscript from that library is E 076, which contains in addition to Ptolemy many texts by Barlaam Calaber de Seminaria, one by Theon Alexandrinus, and comments on Ptolemy's *Harmonics* by Nicephorus Gregoras.³⁵

There are three manuscripts from the Bibliothèque national de France. (12) The most interesting is Coislin 173, which is in fact a compilation of several Byzantine manuscripts.³⁶ The first page has an *ex libris* from the Lavra of Mount Athos, but it is uncertain whether this refers to the whole manuscript or just part of it.³⁷ In any case, this manuscript was copied and extensively annotated by Nikiforos Gregoras. The next manuscript in the BnF, (13) grec 2450, passed through the hands of Catherine de Medici, Queen of France in the 16th century after its first owner, cardinal Niccolò Ridolfi. It contains Ptolemy's *Harmonics* and three minor mathematical texts, by Nicomachus Gerasenus and the Theons of Alexandria and Smyrna.³⁸ (14) The last manuscript from the BnF is grec 2461, which contains one

³¹ See <https://pinakes.irht.cnrs.fr/notices/cote/id/16447>

³² See <https://pinakes.irht.cnrs.fr/notices/cote/id/46279>

³³ See <https://pinakes.irht.cnrs.fr/notices/cote/id/46280>

³⁴ See <https://pinakes.irht.cnrs.fr/notices/cote/id/42971>

³⁵ See <https://pinakes.irht.cnrs.fr/notices/cote/id/42700>

³⁶ See <https://pinakes.irht.cnrs.fr/notices/cote/id/49312>

³⁷ See <https://archivesetmanuscrits.bnf.fr/ark:/12148/cc100229m>, which writes "Il s'agit d'un recueil composé de divers textes attribuables à plusieurs mains."

³⁸ See <https://pinakes.irht.cnrs.fr/notices/cote/id/52082>

manuscript with Ptolemy and Bryennius Manuel's *Harmonica*, and one manuscript with more astronomical texts.³⁹ There are also three manuscripts from the Biblioteca Nazionale Marciana in Venice. (15) Gr. Z. 264 begins with Ptolemy's *Harmonics*, and then has a real assortment of works: logic and physics by Nicephorus Blemmydes; various speeches by Synesius Cyrenensis; Xenophon's *Memorabilia*; and a few *notitiae episcopatum* by Leo Sapiens VI.⁴⁰ (16) Gr. Z. 318 is from the library of Basilius Bessarion, the Latin Patriarch of Constantinople after Isidore, and like him one of the participants in the Council of Ferrara–Florence; Bessarion's library was presented in 1468 to the Senate of the Republic of Venice, thus forming the core of the Biblioteca Nazionale Marciana. It contains another assortment of Byzantine learning on music, including Ptolemy, Porphry, and Bryennius Manuel, as well as Nicomachus Gerasenus, Bacchius Geron, Creticus Mesomedes, and Michael Psellus.⁴¹ Lastly, (17) Gr. Z. 321 was copied by a collaborator of Nicephorus Gregoras named John. It contains Ptolemy, Porphyry, Bryennius Manuel, and Ptolemy's astronomical tables.⁴²

Which brings us to four important manuscripts, already mentioned above, from the Biblioteca Apostolica Vaticana. (18) Vaticanus Gr. 185 contains Ptolemy's *Harmonics*, thoroughly annotated by Nicephorus Gregoras.⁴³ (19) Vat. Gr. 187 includes Porphyry's commentary, as well as various treatises by Barlaam Calaber de Seminaria.⁴⁴ (20) Vat. Gr. 196 contains Ptolemy and Barlaam, too, with the addition of Euclid's *Elements*.⁴⁵ Lastly, (21) Vat. Gr. 198, mentioned above, also comes from the library of Isidore of Kiev, and contains a good assortment of Byzantine learning: Nicomachos Gerasenos and John Philoponos'

³⁹ See <https://pinakes.irht.cnrs.fr/notices/cote/id/52093>

⁴⁰ See <https://pinakes.irht.cnrs.fr/notices/cote/id/69735>

⁴¹ See <https://pinakes.irht.cnrs.fr/notices/cote/id/69789>

⁴² See <https://pinakes.irht.cnrs.fr/notices/cote/id/69792>

⁴³ See <https://pinakes.irht.cnrs.fr/notices/cote/id/66816>

⁴⁴ See <https://pinakes.irht.cnrs.fr/notices/cote/id/66818>

⁴⁵ See <https://pinakes.irht.cnrs.fr/notices/cote/id/66827>

commentary thereon; Michael Psellus; Ptolemy's *Harmonics* with Porphyry's commentary; Manuel Bryennius; Theodoros Meliteniotes; Theon Alexandrinus; and even Proclus.⁴⁶

This concludes my survey of the 14th-century Byzantine manuscripts which contain Ptolemy's *Harmonics*. Before finishing with the manuscripts altogether, I want to briefly mention just one later manuscript, which originates not from a library in Western Europe but rather from a library of the Phanariots, the Greek elite of Ottoman Istanbul. This manuscript is currently held at the Benaki Museum, and comes from the library of Nikolaos Karatzas (Νικόλαος Σκαρλάτος Καρατζᾶς), who lived between 1707 and 1785. The manuscript T. A. (Τμήμα Ανταλλαγών) 250 includes Ptolemy alongside Nicephorus Gregoras, Michael Psellus, and various other authors.⁴⁷ Georgios Papazoglou writes that Karatzas' manuscript is representative of those that “belonged to later Byzantine nobles, never traveled to the West, but remained in the *Basileuoussa* [Constantinople] and, passing from generation to generation, ended up adorning the collections of Phanariot nobles in the 18th century, and mainly the library of some Nikolaos Karatzas.”⁴⁸ It was in this place and time of 18th-century Istanbul that Byzantine music, as we know it from the Greek Orthodox liturgy today, was developed, alongside Ottoman art music and all the other musics of the multi-ethnic Ottoman empire. It is not hard to imagine how Ptolemy's treatise might have resounded in this time and place, as it did 1500 years earlier in equally multi-ethnic, imperial Alexandria, and 300 years after the “end” of the Byzantium in which the manuscript had been copied. And how funny to think that this manuscript, in the hands of an elite Greek in 18th-century Istanbul, was to arrive in Athens in 1923 as part of the exchange of manuscripts under the Treaty of Lausanne.

⁴⁶ See <https://pinakes.irht.cnrs.fr/notices/cote/id/66829>

⁴⁷ See <https://pinakes.irht.cnrs.fr/notices/cote/id/8360>

⁴⁸ “χρφ. που ανήκαν ἄλλοτε σε μεταβυζαντινούς ἄρχοντες, δεν ταξίδευσαν ὁμως προς την Δύση, ἀλλὰ παρέμειναν στην Βασιλεύουσα και, ἀπό γενιά σε γενιά, ἐφθασαν σε αὐτόν τον 18ο πλέον αἰῶνα να στολίζουν τις συλλογές Φαναριωτῶν ἀρχόντων, και κυρίως την Βιβλιοθήκη κάποιου Νικολάου Καρατζᾶ.” Georgios K. Papazoglou, *Ὁ λόγιος Φαναριώτης Νικόλαος Καρατζᾶς και ἡ βιβλιοθήκη τῶν χειρογράφων κωδίκων του (1705 ci.-1787), Τόμος Α'· Βίος και ἔργο τοῦ Νικολάου Καρατζᾶ*, Α' εκδοςῆ, Ἐρακική Βιβλιοθήκη. Σειρά Διατριβῶν και Ἐγχειριδίων, 15 ; 10 (Thessalonikē: Ekdotikos Oikos K. & M. Ant. Stamoulē, 2016). My translation.

Conclusion

I can only draw provisional conclusions at this stage in this project. This last manuscript I mentioned strikes me as as good a place as any to end with. 2023 marks the 100th anniversary of the Treaty of Lausanne that was responsible not just for the transfer of this manuscript containing Ptolemy's *Harmonics* from Edirne to Athens but also the reciprocal expulsion of millions of Christians and Muslims from the territories of Turkey and Greece, respectively. Some have suggested that this was the end of antiquity. This suggestion is (mostly) tongue-in-cheek. But it highlights a point made repeatedly throughout this paper: traditions like ancient Greek music theory do not end (if they ever existed as such to begin with). They are re-inscribed, through textual and social practices (and not only). The history attempted here, of the reception of Ptolemy's *Harmonics* in the Byzantine manuscript tradition, is a contribution to the histories of these practices.

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Editions and translations of classical texts are excluded from this bibliography; in general, I have consulted the bilingual editions in the *Loeb Classical Library* when possible, and the *Thesaurus Linguae Graecae* for the Greek, both in their online editions. I have also left out the reference works cited, which are all accessible online: namely, the *Pinakes* database; the *Oxford Dictionary of Byzantium*; Brill's *New Pauly*; and *Grove Music Online*, the successor to the *New Grove Dictionary of Music and Musicians*.

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