Response to Barker
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or not his conclusions are correct. He is confident that they will agree that they are.

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RESPONSE TO BARKER

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Andrew Barker provides a lucid exposition of Ptolemy's attempt to explain what accounts for the beauty of the music we hear, the beauty of the mathematical relations that govern what we hear, and the connection between the two. His excellent work is, however, problematic for me as a commentator, since I find myself in virtually complete agreement with his account of Ptolemy's position. My comments will thus support and supplement what Barker says rather than contradicting it. In what follows, I will first examine two further examples, Polyclitus and the Pythagoreans, that largely support Barker's account of the role of the central concept, *symmetria*, in Greeks' accounts of beauty prior to Ptolemy. Then, I will argue that the Greek harmonic tradition, including Ptolemy himself, misrepresents the historical development of the antecedents of Ptolemy's theory of beauty among Plato and the Pythagoreans. Although, as a whole, Ptolemy goes far beyond the Pythagoreans in his explanation of beauty, some parts of his account, in fact, represent a return to the Pythagorean position.

As Barker has shown, it was a very common Greek instinct to try to define beauty in terms of *symmetria*, which he translates as "due proportion" or "balance." Thus, Plotinus asserts that beauty "is said by practically everyone to be *symmetria* of parts to one another and to the whole" (*Enn*. 1.6).[1] Barker has also drawn our attention to what appears to be a disappointing failure of most Greek thinkers to say in any precise way what *symmetria* is; ratios are involved, perhaps, but no one steps forward to say which ratios, let alone explain why it is that these particular ratios, rather than some others, produce beauty. It is instructive to examine another example of this Greek fascination with and elusiveness about *symmetria*, the fifth-century Argive sculptor Polyclitus, whom Barker mentions in passing. In a famous fragment from his book *The Kanôn*, he says that "the good" (τὸ εὖ), which in context must mean a good and hence beautiful sculpture, "arises just barely through many numbers" (παρὰ μικρὸν διὰ πολλῶν ἀριθμῶν γίνεται).[2] Although Polyclitus does not use the word *symmetria* here, there can be no doubt that the numbers involved were the numbers in the ratios of the size of the various parts of the body to one another and the whole, and that he was thus defining

1. All translations are my own unless otherwise indicated.
2. DK 40B2.

beauty in terms of due proportion. As I have argued elsewhere, that the correct numbers are "just barely" (παρὰ μικρόν) achieved is probably a reference to the practical difficulties of incorporating the proper ratios in a specific statue;[3] the expression also suggests, however, that it matters very much which ratios are used. Nonetheless, neither the literary tradition nor the attempts of scholars to measure copies of Polyclitus' actual statues indicate what specific ratios Polyclitus had in mind,[4] so that one can doubt whether he in fact provided them and can be even more doubtful that he provided a justification for them. Thus, the case of Polyclitus appears to support Barker's contention that, while appealing to *symmetria*, or due proportion, to explain beauty, most Greeks did not define it in a specific way. Polyclitus is also a good example in making another important point about *symmetria*. No one in the ancient tradition calls Polyclitus a Pythagorean and, despite some scholarly attempts to make him one, there is no good evidence that he was.[5] Thus, the tendency to associate beauty with *symmetria*, with "due proportion" expressed in ratios, is not specifically Pythagorean but is rather a much broader trend in Greek thought.

It is true, nonetheless, that some Pythagoreans did try to explain beauty in terms of *symmetria*. Clear evidence for this attempt first appears, however, only in the fourth century. Neither beauty nor *symmetria* is mentioned in our earliest primary sources for Pythagoreanism, the extant fragments of Philolaus or Archytas.[6] This may, of course, simply be an accident of the transmission. It is nonetheless striking that, while Philolaus and Archytas give a prominent role to number and proportion in explaining both the cosmos (Philol. frags. 4–6a Huffman) and also a properly functioning human society (Archyt. frag. 3 Huffman), they never mention beauty (*kalon*) in these contexts. Instead of beauty the emphasis is on the intelligibility provided to things by numbers. Philolaus, perhaps followed by Archytas, had a program to explain all things, or at least all things that can be known, in terms of numbers.[7] The fact that the world should behave according to something as precise as numerical relationships may well have seemed beautiful to the Pythagoreans, but it does not appear that they asked Plato's question as to why certain numerical relationships were more beautiful than others. Modern scholars, following Ptolemy's lead, have argued that Archytas was already trying to follow the principles later adopted by Ptolemy, according to which acceptable melodic intervals had to correspond to either multiple or epimoric ratios.[8] The difficulty is that the ratios Archytas uses to describe the music of his day fail to fit these criteria; several of them are neither epimoric nor multiple, even though it would have been very easy for him to follow such a rule.[9] The most natural conclusion is that he had not adopted the principle that all melodic intervals must be epimoric or multiple, a principle that he nowhere

3. Huffman 2002.
4. Ibid., 305.
5. Ibid., 324–26.
6. For possible evidence of a definition of beauty by Archytas, see Huffman 2005, 503.
7. Philolaus frags. 4–5; see Huffman 2005, 65–76.
8. Barker 1994, 129.
9. Huffman 2005, 416–17.

asserts. Archytas was content that the music of his day was describable mathematically in accordance with certain very general principles (e.g., that whole number ratios be involved)[10] without expecting it to conform to any more narrowly defined mathematical strictures. It may then be that the Pythagoreans were working with the notion of *symmetria* as commensurability, which Barker finds in some passages of Plato, although not in the passages that deal with beauty. The Pythagoreans were out to show that the world was commensurable with number in that it could be measured and described by it. Even magnitudes that are arithmetically incommensurable, such as the diagonal of the square, are still susceptible to description in terms of mathematical relations, as what later became known as the Pythagorean theorem shows.

The term *symmetria* does finally appear in the Pythagorean tradition in a treatise of Aristoxenus entitled the *Pythagorean Precepts*. Aristoxenus is not here putting forth his own views, but rather, as I would argue, providing valuable evidence for the ethical precepts of the Pythagoreans of the fourth century, including his own teacher Xenophilus of Chalcis, with whom he studied in Athens.[11] In one passage, the Pythagoreans argue for an orderly upbringing of the young, starting right from childhood even in regard to the food that they eat; they base this precept on the principle that "order and due proportion [*symmetria*] are fine/beautiful and advantageous, but disorder and lack of due proportion are shameful/ugly and disadvantageous" (ἡ μὲν τάξις καὶ συμμετρία καλὰ καὶ σύμφορα, ἡ δ' ἀταξία καὶ ἀσυμμετρία αἰσχρά τε καὶ ἀσύμφορα, frag. 35 Wehrli). This is not a definition of *to kalon*, but it shows a clear connection between beauty and due proportion, even in such an apparently unpromising area as the diet of the young. Once again, however, there is no hint of a more precise definition of what is meant by due proportion. Perhaps all the Pythagoreans are claiming is that some sort of due proportion must be observed in the diet of the young, even if it is impossible to specify precise proportions that will fit every case. Elsewhere in the *Precepts*, the Pythagoreans anticipate some aspects of Aristotle's definition of the mean in ethics, notably in recognizing that what is appropriate cannot be defined by a hard-and-fast rule but must be worked out in light of the specific conditions (Iambl. *VP* 180–82).[12] Such an approach is also characteristic of Greek medicine (e.g., Hippoc. *VM* 9) and, hence, it would not be surprising if the *symmetria* to be discovered in the diet of the young was very much determined by circumstances unique to each case. Thus, it appears that the Pythagoreans might not have regarded the lack of a universally applicable set of ratios that constituted "due proportion" as a failing.

As Barker has shown in some detail, Plato is no better about giving the specific ratios that constitute *symmetria*, although he, unlike the Pythagoreans, does clearly regard this as a failing. In the *Republic*, he formulates the crucial

10. For further principles employed by Archytas, see Huffman 2005, 423.

11. Huffman 2008.

12. This section of Iamblichus' *On the Pythagorean Life* is not included in Wehrli's collection of the fragments of Aristoxenus, but most scholars have regarded it as deriving from Aristoxenus, e.g., Rohde 1872, 49–50, and Burkert 1972, 101, n. 17.

question about *symmetria* to which Ptolemy appears to give the first successful answer, "which numbers are concordant and which not and why" (*Resp*. 531c). Moreover, the nuptial number in *Republic* 8 (546b–d) and the ratios used in the construction of the world soul in the *Timaeus* (35a–36b) at least express a desire for precision in specifying what due proportion is, although the extravagant language of the former passage in particular (e.g., "whereof a basal four-thirds wedded to the pempad yields two harmonies at the third augmentation")[13] suggests that Plato expected that complexity, rather than Ptolemy's simplicity, would characterize at least some of the ideal ratios.

What is remarkable about Ptolemy, then, in contrast to the earlier Greek tradition, is that he defines *symmetria* in a precise way; he provides the actual ratios that govern beauty in the music of his day and explains why it is just these ratios that do so, as well as how the beauty of those ratios relates to the beauty we hear. Moreover, his account of beauty in music has broader applications to beauty elsewhere and, in particular, to visual beauty. The key concept in identifying these ratios and defending them is "simplicity of comparison." In broadest terms, things are beautiful insofar as they provide from themselves a measure that shows that their parts are related to one another in perspicuously simple ways. Sensible things get their beauty from the ratios that govern their structure, so that their beauty is ultimately based on the beauty of ratios. The ratio 9:3 is a beautiful ratio, because the smaller term, the number three, serves as a clear measure of the larger term, nine; it measures nine an even three times. On the other hand the ratio 9:4 is not beautiful, because it provides no such clear measure: four does not measure nine in a simple way. Again, the ratio 8:6 is much more beautiful than the ratio 7:5, but this is not a matter of beauty being in the eye of the beholder; there are principles at play. The ratio 8:6 provides a measure in terms of which we can see the relation between its two parts. In this case the measure is not one of the terms but the difference between them, namely, two. The number two measures both terms and we can see that there are four twos in eight and three twos in six. The ratio 7:5, on the other hand, provides us with no measure that allows us to understand the relation between the two terms. Five is not a measure of seven, nor is the difference between them, two, a measure of either five or seven. Thus, in the ratio 7:5 we have no simple way of seeing the relation between the two terms and, hence, there is no beauty in the ratio.

One of the crucial points in Barker's paper is that Ptolemy not only answers Plato's question about which numbers are harmonious and why, he also goes on to do something for which Plato did not ask, that is, to explain the connection between these ratios and the actual sounds that we hear. When we hear music, what we are listening to does have a quantitative dimension, and our senses do a sort of unconscious arithmetic when we perceive sound as beautiful. It is doubtful that Plato would have appreciated this last step, since Plato in effect calls on us to let go the harmonies that we hear and focus only on the intelligible harmonies of numbers (*Resp*. 530b–c and 531c). In

13. Trans. Shorey (1935, 247).

terms of the tradition of Greek harmonics, it is not Plato, however, but the Pythagoreans who are presented as responsible for separating the mathematics of music from the music we hear to the detriment of what we hear. Ptolemaïs of Cyrene, writing in the first century B.C.E., says that "if the system discovered by reason in its enquiry no longer chimes with perception, [Pythagoras and his successors] do not retrace their steps but level accusations, saying that perception is going astray, while reason by itself has discovered what is correct."[14] Thus, Ptolemaïs' Pythagoreans separate the head of reason from the body of perceptions. Ptolemy himself attacks the Pythagoreans because they "did not follow the impressions of hearing, even in those things where it is necessary for everyone to do so."[15] The Pythagoreans, or at least the early Pythagoreans, however, are falsely accused. It is perfectly clear that it is Plato who made the radical split between reason and perception. In the *Republic*, when Plato is calling for the study of which numbers are harmonious and why, he does so in criticism of the Pythagoreans (531c). His specific complaint about them is that they study numbers in heard harmonies rather than the numbers themselves (531c). So Plato is complaining precisely because the Pythagoreans keep the numbers firmly attached to the sensible world, that is, to the actual music we hear.

It is not often enough recognized that the Pythagoreans could not have followed Plato's suggestion to study harmonious ratios in themselves and let go the heard harmonies, because they did not have a two-world system. They did not distinguish between an intelligible and a sensible realm as Plato does. Aristotle makes this quite clear in several places. Thus, in the *Metaphysics*, as part of his comparison between Plato and the Pythagoreans, Aristotle says that it was peculiar to Plato to regard numbers as distinct from sensible things, while the Pythagoreans regarded things themselves as numbers (987b27–29). I think that Aristotle did not quite get the relationship between things and numbers in Pythagoreanism right, but he could not be clearer that the Pythagoreans did not think of numbers as belonging to some other realm than the sensible. The fragments of Philolaus and Archytas fully support Aristotle's point, since they betray no trace of a distinction between the sensible and intelligible world.

For the Pythagoreans, mathematics had to work for the phenomena, that is, the numbers had to be those of the heard harmonies, because there was nothing other than the physical world to describe. For Philolaus, nothing can be known without number (frag. 4 Huffman), and the individual things in the world "give signs" of the many kinds of numbers (frag. 5 Huffman). The goal for Philolaus was to gain knowledge of things in the physical world through the numbers indicated by the study of phenomena, so that the numbers had to be closely tied to the physical objects. Archytas appears to have followed Philolaus' lead, and he is likely to be the object of Plato's attack in the *Republic*, since he succeeds brilliantly in describing the actual music of his day

14. Ptolemaïs in Porph. *In Ptol. Harm.* 23.24–31 Düring 1932, trans. after Barker 1989, 240.
15. Ptol. *Harm.* 6.1–2 Düring 1930, trans. Barker 1989, 279.

in terms of numbers.[16] For the Pythagoreans of the fifth and fourth century, the mathematics of the head could not be separated from the perceptions of the body or the patient would die. The head could only talk, could only tell us things of interest, if it was firmly attached to the body. Plato, on the other hand, seems to have believed the myth of Orpheus, to have thought that Orpheus' head, or the study of ratios, could sing detached from the phenomena as it floats down the Hebrus river and, thus, had no compunctions about cutting it off.[17]

So the later tradition, represented by Ptolemaïs and Ptolemy, which described as Pythagorean the view that the study of ratios and proportions could and should be cut off from the phenomena is not an accurate account of fifth- and fourth-century Pythagoreanism but is rather an account of Platonism, which became erroneously identified as Pythagoreanism. After Plato's death, we know that a great deal of what is, in fact, late Platonic thought gets labeled as Pythagorean.[18] The same thing appears to have happened in harmonic theory. It is one of the ironies of the ancient harmonic tradition that Ptolemy should end up attacking Pythagoreans for not following "the impressions of hearing" (*Harm*. 6.1–2 Düring), when Plato attacks them precisely for following the "heard harmonies." In his admirable book on Ptolemy, Barker states Ptolemy's view succinctly: "it is the rational order *in* the phenomena that the scientist is seeking to uncover, not some other [rational order]."[19] Philolaus and Archytas emphatically agree that the rational order they are seeking to uncover is in the phenomena and do not need a lecture from Ptolemy on the point. He is in a sense returning to the position of the earlier Pythagoreans, although that position is now formulated in a much more sophisticated way because of the need to heal the breach between mathematics and phenomena created by Plato. On the other hand, Ptolemy has gone far beyond the early Pythagoreans in saying what makes that order beautiful, and he was partly inspired to do so by Plato's attempt to separate the beauty of mathematics from perceptible beauty.

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16. Huffman 2005, 410–25.

17. I borrow the image of Orpheus in this connection from the original version of Barker's paper, which was given at the conference in 2008.

18. Burkert 1972, 82–83.

19. Barker 2000, 70.