

Porphyry's Commentary on Ptolemy's *Harmonics*

A Greek Text and Annotated Translation



ANDREW BARKER

PORPHYRY'S COMMENTARY ON PTOLEMY'S *HARMONICS*

Porphyry's *Commentary*, the only surviving ancient commentary on a technical text, is not merely a study of Ptolemy's *Harmonics*. It includes virtually free-standing philosophical essays on epistemology, metaphysics, scientific methodology, aspects of the Aristotelian categories and the relations between Aristotle's views and Plato's, and a host of briefer comments on other matters of wide philosophical interest. For musicologists it is widely recognised as a treasury of quotations from earlier treatises, many of them otherwise unknown; but Porphyry's own reflections on musical concepts (for instance notes, intervals and their relation to ratios, quantitative and qualitative conceptions of pitch, the continuous and discontinuous forms of vocal movement, and so on) and his snapshots of contemporary music-making have been undeservedly neglected. This volume presents the first English translation and a revised Greek text of the *Commentary*, with an introduction and notes designed to assist readers in engaging with this important and intricate work.

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Introduction

I Porphyry's life and writings

Almost everything we know about Porphyry's life comes from remarks of his own, scattered here and there in his biography of Plotinus (*Vita Plotini*). The short account in Eunapius' *Lives of the Sophists*,¹ effusive though it is in Porphyry's praise, adds little of any substance, and few other writers tell us anything at all. We know that he was born in Phoenicia in AD 233 or 234, perhaps in Tyre, where he was brought up.² As a young man he studied for several years in Athens, mainly with Longinus, the most distinguished literary scholar and critic of his generation (Eunapius describes him as 'a living library and a walking shrine of the Muses'). Longinus was also a respected philosopher, the leading exponent and interpreter of Platonism in Athens.

In 263/4, at the age of thirty, Porphyry joined the circle of Plotinus in Rome, a city humming with cultural and intellectual activity. Plotinus and Longinus disagreed on substantial issues, and the former apparently regarded the latter as a philosophical light-weight, 'a man of letters but in no way a philosopher'.³ Possibly Porphyry had already formed a similar impression, but his move to Rome cannot have been motivated by a conviction that Plotinus' philosophical opinions were correct. He was not yet familiar with his opinions, let alone persuaded by them; he tells us that he misunderstood Plotinus' lectures when he first heard them, and wrote

¹ *Vit. soph.* 455–7 in Boissonade's 1822 edition; his pagination is reflected in the marginal numbers printed in the Loeb edition (Wright (1921)).

² His original name was Malchos, meaning 'king' in the local language. According to Eunapius it was Longinus who gave him the Greek name Porphyrios, 'purple' or 'crimson', with an eye to the colour's regal connotations (and perhaps also to the shared Phoenician origins of both Porphyry and the famous purple dye). He evidently adopted it as his regular name. Some of his colleagues in Rome called him Basileus, the standard Greek term for a king or emperor, but this was probably just an affectionate nickname used by his friends, including Longinus himself (*Vit. Plot.* 21), after Porphyry had moved from Athens to Rome.

³ *Vit. Plot.* 14. For Longinus' views on Plotinus and others see *Vit. Plot.* 19–21.

an essay trying to demonstrate that his views on one important issue were wrong. It was only after a series of written exchanges with Plotinus' most faithful and long-standing associate Amelius that he finally grasped the force of Plotinus' reasoning and the truth of his conclusions (*Vit. Plot.* 18).

Porphry stayed with Plotinus for six years; they became close friends, and Plotinus entrusted him with the task of revising his writings for publication (*Vit. Plot.* 7). He devoted himself to the project after his master's death. It cannot have been an easy matter. Plotinus' eye-sight was poor, and Porphyry had to cope with his sprawling handwriting, with his carelessness over spelling and other elementary points of presentation, with problems of sense and coherence arising from his refusal to re-read and polish anything he had written, and with the fact that the corpus was an enormous mass of disconnected essays bundled up in no intelligible order. It seems quite likely that Plotinus chose Porphyry as his editor as much for his literary skills and sensibilities – honed, as presumably they were, during his time with Longinus – as for his philosophical acumen.⁴ But whatever his reasons were, Plotinus chose well, at least in picking an editor who would not shirk his responsibilities. The outcome is the work we know as the *Enneads*.

By the end of his first six years in Rome Porphyry faced a personal crisis whose exact nature and causes we do not know, and from his brief statements in *Vit. Plot.* 11 we might infer that he did not know them himself. A modern doctor might have diagnosed his condition as clinical depression. He was contemplating suicide, but Plotinus dissuaded him, advising him that he might recover his zest for life if he left Rome for a time. He took the advice and travelled to Sicily, where it seems that he found that Plotinus (as always) had been right.

News of Plotinus' death (AD 270) reached him there a few months later. Whether he went back to Rome immediately or extended his absence is unclear, nor can we be sure whether he inherited the headship of a formally established 'school' from Plotinus on his return; but he evidently came to be recognised as the leading figure among Plotinus' followers and as the foremost philosopher in the city. Apart from the record of his copious writings and his work on the material Plotinus had left, we know few details of this phase of his career except that he married a friend's widow, Marcella, to whom one of his essays is addressed. (According to Eunapius,

⁴ Eunapius writes in glowing terms of the clarity and beauty of Porphyry's style. He himself is no stylist and he may be an unreliable judge; and no one reading Porphyry's surviving works now will find these virtues on every page (they are conspicuously absent from much of the commentary translated here). But at certain points in his writings (in passages of the *ad Marcellam*, for instance, and in some of the longer *Sententiae*) we may be able to see what Eunapius had in mind.

he married her to ensure that his friend's numerous children should be given a good education.) The *Life of Plotinus* was published in AD 301 or shortly afterwards, and Porphyry probably died only a little later, but our information is not very precise. Eunapius tells us only that he reached 'an advanced old age'. The *Suda* is a little more helpful, saying that he lived 'into the time of the emperor Diocletian', which probably means that he died before AD 305 when Diocletian abdicated. If we use that as a marker, Porphyry was about seventy years old when he died. But Diocletian lived on for another seven years or so, and it is possible, though much less likely, that the *Suda's* source reckoned 'the time of Diocletian' as ending only with his death.

Fifteen of Porphyry's works survive either complete or as incomplete texts containing a large proportion of the whole, and we also have a substantial body of shorter fragments.⁵ On the basis of cross-references in Porphyry's own surviving writings, and of the treatise titles, quotations and reports provided by later authors, recent scholars have tried to establish the number of works that he actually wrote; the highest estimate I have come across is 81 and the lowest is 59.⁶ They included essays on metaphysical issues, incorporating influential developments of thought beyond the doctrines of Plotinus and perhaps sometimes in conflict with them; commentaries on Aristotle's treatises in logic, metaphysics, physics and ethics; commentaries on several of Plato's dialogues; a history of philosophy from its beginnings to Plato; various other historical writings; commentaries on the Homeric poems, and essays on other philological topics; a large number of works on religious traditions and rituals; and a handful of pieces on technical subjects, one of which is his commentary on Ptolemy's *Harmonics*.

2 The commentary on the *Harmonics*: General profile

Porphyry presents his work as a 'commentary' in the strict sense of the word.⁷ After a brief but thought-provoking introduction he works his way systematically through Ptolemy's text in its original order, usually prefacing each phase of his discussion with a lemma quoting the passage of the *Harmonics* which it is designed to elucidate, and in most cases

⁵ For the most authoritative collection of fragments see Smith (1993).

⁶ The higher estimate is that of Romano (1979): 217–21. The more conservative and more recent assessment is that of Smith (1993): L–LIII (he adds six others which in his view are certainly or probably spurious).

⁷ The most important MSS include the regular term for a commentary (*hypomnēma*) in its title. In his introduction Porphyry refers to it as an *exēgēsis*, an 'exposition' or 'explication' (3.17, 4.24, 5.18, cf. 4.23).

the successive lemmata leave no gaps in Ptolemy's text.⁸ Porphyry plainly intended his commentary to cover each chapter of the *Harmonics* in full and to respect the continuity of its arguments; it was not designed merely as a set of reflections on selected excerpts.

He says in his introduction that he will aim, for the most part, at 'due proportion' (*symmetria*) in his dealings with the text (4.22–4). He can hardly mean that he will make the length of his discussions proportionate to that of the passages they address, since in this respect his treatment of the lemmata is very uneven. A single sentence may provoke several pages of comment, while much longer passages attract only a cursory glance. He must mean that the length and depth of his discussions will be governed by his estimate of the importance of the passages they consider and that of the issues they prompt him to examine, and in that case their length, and perhaps also their degree of complexity, depends as much on his own intellectual interests and priorities as on Ptolemy's. This point will clearly have a bearing on the fact that while the disparities in his treatments of passages within any one chapter are rarely obtrusive or surprising, there is a striking imbalance between his discussions of the earlier and later parts of Ptolemy's text. The commentary runs to 172 pages in Düring's edition and covers 55 pages (22 chapters) of the *Harmonics*. But by the end of I.4, after dealing with eight of Ptolemy's pages, 87 pages of the commentary have gone by and we have passed the half-way point; and for the text of I.5–I.8 (a little over nine pages in Ptolemy) there are 34 pages of commentary. At the end of I.8 we are already more than two thirds of the way through the commentary, with only 51 pages left for the remaining 14 chapters (about 38 of Ptolemy's pages).

Some sections of the commentary are swollen by another of its most striking features, that is, its profusion of quotations from earlier writings. Several of them are very long, substantially increasing the length of the sections in which they appear, and by far the majority of them appear in the commentary's first few chapters.⁹ The longest single quotation runs from 67.24 to 77.18, nearly ten pages in Düring's edition; it forms part of the twenty-two-page commentary on *Harm.* 9.6–15, which incorporates about seventeen pages of quotations. This is an exceptional case; many

⁸ But there are certain omissions. On this matter and other issues to do with the lemmata see [Section 10](#) below.

⁹ The flood of quotations dwindles to a trickle after I.5. In I.6–7 there are just a few lines of quotation, and I.9 and I.12 contain about half a page each. No quotations appear in I.8 or I.10–11, and in the ten chapters from the beginning of I.13 to the end of II.7, where the commentary breaks off, there are none at all.

of Porphyry's quotations are only a few lines long, and only a handful cover more than a couple of pages. But there are a great many of them, mostly from works by philosophers or musical theorists, but also from mathematicians, natural scientists, grammarians and other scholars and occasionally from poets.¹⁰ Porphyry makes a point of saying plainly in the introduction that he intends to make use of what his forerunners had said; he will not try to pass off these borrowings as his own, as some writers had done, but will conscientiously name the authors whose work he transcribes (as indeed he does, with very few exceptions). He denies that the practice should be held against him as plagiarism, defending it on the grounds – all the more piquant now, in a world where the internet is king – that what has been written, and especially what has been well said, is public property available for everyone's use (4.24–5.16).

The more one examines these quotations and their contexts, the clearer it becomes that they are not there merely for their antiquarian interest, or to show off Porphyry's extensive learning, or to conform to an established canon of conventions like those governing a modern Ph.D. thesis, or simply to save time, as he rather naively puts it at 4.25–6. On the contrary, they contribute substantially to his arguments, exemplifying and adding detail to the points that currently concern him, developing the grounds for his conclusions, setting them in the context of ancient and on-going debates, playing different authors off against one another, and sometimes (as notably in his quotations from Plato and Aristotle at 46.5–13 and 47.15–23) providing a springboard from which he can launch himself into controversial territory. At the end of the same passage, he uses long quotations from Theophrastus and Panaetius (61.22–67.10) to give additional authority to the contentious conclusion he has reached. Although he does not always directly explain their bearing on the issues in hand, it turns out on inspection that in almost all cases the quotations have been carefully integrated into his agenda at appropriate moments, and contribute intelligibly to his line of thought.

We cannot be sure when the commentary was written. In view of its huge collection of quotations we can certainly say that wherever Porphyry was when he wrote it, he had a well-stocked library at his disposal; but that would be the case whether he was in Athens or in Rome, though perhaps not in Sicily. So far as the musicological content of the work is concerned, it might have been composed at any time in Porphyry's life, and almost

¹⁰ I have not tried to quantify the total amount of quotation exactly. But on a rough count it amounts to about forty-three of Düring's pages, a quarter of the commentary's length.

all the philosophical indications can be taken to point either backwards to pre-Plotinian Platonism or forwards to the works of Porphyry's maturity, into which he absorbs as much from Middle Platonist writers as he does from Plotinus himself. Its lack of literary polish, except in a few isolated passages, might incline us to doubt that Porphyry wrote it while he was still under the influence of Longinus in Athens; but style is an uncertain guide, and the elegance desirable in a free-standing, discursive work may not have seemed necessary or appropriate in a commentary on a technical treatise.

But the text gives one fairly clear pointer to a date in the later part of his career. At 115.27–116.1, referring to the scale constructed in Plato's *Timaeus*, he says that he gives an explanation of its exceptionally large compass in other writings. This is not a promise of some future enterprise; his 'we give' is in the present tense, implying that the writings already exist. It must almost certainly refer to his commentary on the *Timaeus* (now surviving only in fragments), and this is most unlikely to have been an early work. In any case my own opinion, for what it is worth, is that the commentary is not a piece of juvenilia. It is the work of a mature philosopher with many years of dedicated scholarship and reflection behind him (see further [Sections 6](#) and [7](#) below). He draws freely, as we have seen, on the writings of earlier philosophers, especially Plato and Aristotle, and of mathematicians and other scientists as well as specialists in musical theory, offering perceptive interpretations and deploying them judiciously in the service of his project; and at least on philosophical issues he presents his own independent contributions with confidence and flair. Although he has less of his own to offer when he focuses on more specifically musicological matters, what he does contribute is carefully considered and by no means negligible.

The commentary has not been translated into English before, but translations, it appears, behave much like London buses; after long stretches of time in which there's no sign of any at all, several turn up at once. Just so, this translation coincides almost exactly with another, an Italian translation by Massimo Raffa.¹¹ Perhaps this is not just a coincidence. Specialists in ancient Greek musical theory have often drawn on this text, though almost always for its quotations from other sources, and in recent decades their subject has ceased to be the preserve of a handful of eccentrics; there are very many more of us now. Over the same period the study of Greek philosophy in later antiquity has also moved from the fringes into the main stream,

¹¹ For his previous translation of Ptolemy's *Harmonics* see Raffa (2002).

and the rich philosophical reflections in the first few chapters of Porphyry's commentary have attracted considerable attention. In the same time-frame the study of ancient commentaries in general has made great progress, due especially to the work of Richard Sorabji and his collaborators, who have published a massive array of translated ancient commentaries on Aristotle.¹² It rather looks as if this commentary's time has come.

3 The commentary as a fragment

The commentary is not complete. Two pieces are missing, one short and one very long, and in both cases we should try to decide whether they were lost at some early stage in the process of transmission, or whether we do not have them because they were never written. The shorter passage is at the end of Book I; each of Ptolemy's three Books had sixteen chapters, and there is no commentary on I.16. That might, in principle, be for any of four reasons: the text of Ptolemy available to Porphyry might have lacked this chapter; or he might have found nothing in it that he thought worth discussing; or he might have postponed the task in order to do further research before tackling it but never in fact returned; or he wrote it and it was subsequently lost.

The first of these possible reasons can be dismissed immediately. Porphyry refers to the content of Ptolemy I.16 in the course of his discussion of II.1 (which deals with aspects of the same topic from a different angle), and it is clear that he knew it. The second is initially tempting. Ptolemy's chapter moves away from the theoretical derivations of scale-structures with which he had previously been occupied. It tells us that with just one exception they do not reappear in their theoretically unadulterated forms in music that is actually performed, and that some of them are not found there at all; and it explains how those of them that contemporary musicians used were combined and sometimes modified in their patterns of attunement. Together with the later passages which complete his account of these attunements (II.1 and II.16), it is of great interest to students of ancient musical practice, but one might suppose that an abstractly minded philosopher would have found nothing in it to whet his appetite. But this will not do. For one thing, there are certainly philosophical questions to be raised about the extent to which Ptolemy's manipulation of his theoretical results in this chapter is consistent with his previous declarations about scientific

¹² Sorabji (1989–). Over sixty volumes have been published to date, and the series continues to grow. See also Sorabji (1990).

methodology. Again, Porphyry had already worked his way through seven chapters in which he had scarcely fluttered his philosophical wings, and would doggedly continue to do so through parts of Book II; he is unlikely to have abandoned his task in this isolated case. More conclusively, he addresses Ptolemy's second visit to the subject in II.1 with enthusiasm and at considerable length (introducing modifications which have posed severe problems for modern interpreters; see [Section 5\(c\)](#) below), and he clearly assumes that his readers are already familiar with the content of his missing chapter. Hence the second possible reason must be rejected. The third remains hypothetically feasible, though the considerations that undermine the second make it fairly improbable, and I would judge that the fourth is almost certainly correct: the commentary on this chapter was written but was subsequently lost. This hypothesis gains support from defects in the manuscript texts at the end of the preceding chapter, I.15, which not only leave minor uncertainties and lacunae but also lack any comments on the final sentences of Ptolemy's discussion. Further, if I.15 originally ended at the point where our text of the chapter runs out, and if that were also the end of the whole commentary on Book I, we would expect to find appropriate indications in those of the MSS that mark chapter-endings elsewhere; but there are none. It seems probable, then, that the last lines of the commentary on I.15 have been lost, and that Porphyry's discussion of I.16 was lost with them.¹³

The long omission is less easily explained. In its surviving form Porphyry's commentary breaks off at the end of II.7, leaving nine further chapters of Book II and the whole of Book III untouched. The absence of any discussion of Book III is especially regrettable. We could have learned much from Porphyry's reflections on the philosophical musings of III.3, and on the subsequent chapters in which Ptolemy puts harmonic theory to work in the service of human psychology and the study of the heavens. He could also have preserved valuable information about the content of Ptolemy's last three chapters, which were wholly or partly lost at an early stage of the text's transmission and of which we now have only the reconstructions offered by Byzantine editors.

We shall probably never know whether Porphyry completed his commentary or not. One day some lucky Egyptologist might conceivably stumble on a hoard of papyri that would settle the question, but as things stand we have no evidence – or at least no evidence outside the commentary

¹³ In this connection an anonymous reader makes the point that the MSS also omit the ends of all Proclus' lemmatic commentaries on Plato.

itself – to support any judgement at all. Internal evidence cannot give us a definite answer (there are, for instance, no references forward to any part of the commentary after II.7, which might at least have clarified Porphyry's intentions), but it makes me lean tentatively to the view that he abandoned the task or put it aside in favour of other projects. Perhaps he intended to come back to it one day, but in the event he never did so. By the point at which the text runs out he had already laboured through a long series of technically demanding chapters in which he had found little fuel for independent thought, and there were a dozen more in a similar vein to come before he could emerge into the philosophically alluring uplands of III.3 and its sequels. It would not be very surprising if he lost his appetite for the task and left it unfinished; even the almost indefatigable Porphyry might have found it too wearisome to contemplate. There is also another, perhaps more compelling reason why he might have thought it pointless to continue, but I must postpone it until we have considered his purposes in writing the commentary (Section 7 below). None of this comes anywhere near to proving my hypothesis, of course. Maybe he soldiered on to the end, and the later parts of the manuscript from which all ours are derived were mislaid by a careless librarian.

4 The philosophical content of the commentary

Porphyry is not known for any other works on music or musical theory.¹⁴ His interests spanned a wide range, but he was above all a philosopher, and it is primarily as a philosopher that he addresses Ptolemy's text.¹⁵ The genre of commentary had long been established as the most important vehicle for original philosophical and philological thought, a fact that observations by David Sedley may do much to explain (he is initially referring to the way in which Stoics in the first century BC treated an outdated thesis propounded by Zeno of Citium). 'Now, such was the commitment in philosophical schools to the truth of the founder's word that subsequent Stoics could not simply disown this argument and its implications. Philosophical debate within schools was presented as recovery and interpretation of the founder's

¹⁴ He certainly discussed the musical construction of the World Soul in his commentary on the *Timaeus*; see Procl. *In Tim.* vol. 2, 214.6–215.4 Diehl = Porph. *In Tim.* fr. 69 Sodano. But Proclus does not cite Porphyry when examining the mathematical technicalities of the construction, and we know nothing of any detailed analysis he may have offered.

¹⁵ For a general assessment of the light shed by the commentary on Neoplatonist thought see Gersh (1992). There is a useful conspectus of recent work on its philosophical aspects (focused especially on I.1 and I.3) in Chiaradonna (2012).

true views, not as their replacement or revision.¹⁶ Porphyry, of course, was not signed up to any Ptolemaic *hairesis* – no such ‘school’ existed – but he presents arguments against Ptolemy’s views only twice, once over a major issue (see Section 4(b) below) and once on the details of a definition (of no great importance in its context, though with significant implications for modern classicists; see pp. 42–3 below). Throughout the rest of the commentary he treats Ptolemy with much the same kind of respect as was given to the founder of a school by its adherents.

One of the features of the *Harmonics* that especially attracted Porphyry was the philosophical richness of its reflections on scientific method, and on the roles of sense-perception and reason in the proper conduct of investigations in the science that concerns him here.¹⁷ Only the first two of Ptolemy’s chapters are devoted almost exclusively to these topics (they amount to three pages, to which Porphyry gives twenty-four pages of discussion), but both writers return to them from time to time elsewhere (for instance towards the end of Porphyry’s I.7), and repeatedly draw attention to the ways in which Ptolemy is applying the principles he has established. In I.3–5 Porphyry finds further opportunities for elaborate philosophical excursions of other sorts, and though I.6–7 are designed mainly to explain the technical terminology that Ptolemy uses in these chapters and to elucidate his musicological arguments, they too repay reading with the eyes of a philosopher, and have a good deal to interest historians of mathematics. But from I.8 onwards the *Harmonics* offers less grist to a philosopher’s mill (though for non-philosophical reasons Porphyry has a good deal to say about that chapter too), and this is clearly one reason why Porphyry’s comments become so much more perfunctory from I.9 onwards. From a philosopher’s perspective, the first five chapters of the commentary are the most challenging and important. I cannot examine their arguments closely here, but after sketching some of their most prominent topics I shall add a little more detail about two particularly remarkable passages.

Ptolemy opens the *Harmonics* by defining his science, harmonics and its subject-matter; what harmonics studies, he says, are the differences

¹⁶ Sedley (1998): 68–9. In Sedley (1997): 114 with n. 11 he argues that the origins of this use of the commentary form go back to Crantor’s commentary on the *Timaeus* in the early third century BC; he finds no evidence for the contrary view of Dörrie and Baltes (1987–2002) vol. I: 328, vol. III: 166. Commentaries on Aristotle first appeared around the end of the Hellenistic period: see especially Gottschalk (1990), Sedley (1997). For Porphyry as the first Platonist commentator on Aristotle see Karamanolis (2004).

¹⁷ These aspects of the *Harmonics* are discussed in Barker (2000). For Porphyry’s preliminary comments on Ptolemy’s philosophical credentials see 4.16–21.

between high and low pitches in sounds. Porphyry begins I.1, correspondingly, with a study of Ptolemy's definitions and of those that other theorists have provided for the science and its subject, commenting on their merits and defects, and discussing the ways in which different definitions lead to different investigative strategies. Later in the chapter, drawing implicitly on Aristotle, he analyses three types of definition, and examines the distinctions and relations between definitions and demonstrations. In several passages elsewhere in the commentary he again examines definitions that theorists have offered for concepts central to the science, dwelling on the conditions they should fulfil and on the traps into which an inadequate definition can lead. His insistence on accurate definitions should not be mistaken for mere pedantry. They carry substantial implications both about the nature and constitutive elements of the science's subject, and about the methods by which the investigation should be conducted.¹⁸ There is nothing trivial, then, about the scientist's task of defining key concepts precisely and appropriately, guided by a philosophically informed understanding of the logic of definitions and the epistemological and ontological commitments they may involve.

But both Ptolemy and Porphyry devote the bulk of I.1 and I.2 to a group of fundamental epistemological issues, which are often revisited more briefly in later chapters. At the heart of them are questions about the roles that should be assigned to sense-perception and to reason (especially mathematical reason) in the pursuit of scientific truth. They are introduced in the context of debates about the 'criterion of judgement', which – together with the closely related 'criterion of truth' – had been a regular topic of discussion since the Hellenistic period.¹⁹ Ptolemy uses his reflections on these issues not only as a foundation for his own methodology, but also as the main setting for his critiques of the competing positions of followers of the two main traditions in harmonic science, the Pythagoreans and the Aristoxenians, which occupy much of Book I. (He does not in fact mention them until I.2, whereas in the commentary they already play leading roles in I.1.) Porphyry expands Ptolemy's discussions of the contributions that can and cannot be made to science by perception and by reason respectively, of the extent to which each is reliable in its own sphere,

¹⁸ Cf. Gersh (1992): 149. 'Since Neoplatonist writers invariably hold that all terminology in the texts upon which they comment is technical in character and fixed in its range of meanings, even passing allusions evoke complex structures of thought extending considerably beyond the basic sphere of discussion.'

¹⁹ For discussions of the concept of a 'criterion' and its history see especially Striker (1974) and (1990), Brunschwig (1988), and Huby and Neal (1989), which includes also an edition and translation of Ptolemy's short treatise *On the Criterion*. Cf. also Dumont (1982).

of the connections between sense-perception and matter and between reason and form, and of the ways in which the powers of each faculty supply what is lacking in the other. Neither on its own is adequate to the task of establishing truths in the field of harmonic science. Hence they should not be treated as rivals, and although reason will play the dominant part in significant respects and sense-perception will pay it due homage, scientific enquiry must bring them into a cooperative partnership in which each performs its appropriate tasks. He also pursues issues about the causal role of reason, which Ptolemy mentions only in passing at this point in the text.²⁰ From there he proceeds by stages into one of the most fascinating philosophical passages in the commentary (II.1–15.29), of which I shall say more in [Section 4\(a\)](#); it has no direct counterpart in the *Harmonics*, but I shall argue below that Porphyry's inclusion of it here is nevertheless well judged. It is a sustained discussion of the sequence of steps through which an enquiring mind progresses from an initial perception to complete understanding, of the parts played in the progression by various mental faculties and of the nature of the processes involved. It culminates in a series of graphic images and analogies which bring us back eventually to the broader themes to do with sense-perception and reason which occupy the rest of the chapter.

I.2 is shorter, and much of it is taken up with quotations from two earlier writers. Most of Porphyry's own comments are concerned with the 'criteria' adopted by theorists in the two principal harmonic traditions, the Pythagoreans and the Aristoxenians; his expositions and criticisms add little to those of Ptolemy, and like Ptolemy he makes no attempt to identify variant positions in either school of thought. By contrast, one of the writers he quotes, Ptolemaïs of Cyrene (the other is a musical theorist named Didymus²¹), makes interesting distinctions between two Pythagorean viewpoints, that of 'Pythagoras and his successors' (25.10–14) and that of the Pythagoreans who quarrelled most vigorously with empirically oriented theorists (25.25–26.1). She also picks out differences between the views of Aristoxenus himself (25.18–25) and 'some of the *mousikoi* who follow Aristoxenus' (26.1–4), and identifies one other group who apparently stand outside both traditions (25.14–16, cf. Didymus at 26.6–15). Between them Ptolemaïs and Didymus provide a finer-grained

²⁰ In his allusion to 'cause' at *Harm.* 3.5; cf. also 5.19–24. He develops the theme more fully in III.3.

²¹ Porphyry asserts at 5.11–14 that much of Ptolemy's work was based on the writings of this Didymus. In the passages quoted here Didymus is evidently dependent in part on Ptolemaïs, but (so far as we can see from Porphyry's selective quotations) he omits some of her distinctions, while significantly expanding her account of Aristoxenus' views.

classification of these competing views about the criterion than any other ancient writers on harmonics, distinguishing at least five different positions that previous theorists had adopted. Ptolemaï's may have lived quite early in the Hellenistic period, while Didymus probably belongs to the first century AD, and their reports clearly need to be interpreted against the background of philosophical debates on the criterion that were current in their times.

Ptolemy's third chapter is designed primarily to establish the conclusion that differences of pitch are essentially quantitative, and hence that they can properly be represented and studied in mathematical terms. He asserts that the only way of discovering whether they are differences of quantity or of quality is to consider the nature of their causes. In pursuit of this objective he examines a long series of ways in which the causal antecedents of a sound may vary, classifies them as qualitative or quantitative, and identifies each of the attributes of sound which result from these differences in its causes.²² Porphyry's commentary on the chapter is the longest in the work and includes much the largest volume of quotations. He follows Ptolemy step by step through his arguments, elucidating them as he goes; but fully half of the chapter (43.23–67.14) is devoted to the task of demonstrating not only that Ptolemy's reasoning on the subject of pitch is flawed but that the conclusion he draws is wrong. Differences in pitch are differences of quality, not of quantity.²³ Only a couple of short passages elsewhere in the commentary can be construed as criticisms of Ptolemy, and the fact that Porphyry sets up this particular dispute with him and develops it at such length demands an explanation. But the passage is also of great philosophical interest in its own right, partly for the subtlety of its argumentation, and especially on account of three of its other features: its construction of a disagreement between Plato and Aristotle and its recruitment of the controversy to his theme; its rather half-hearted gesture at a strategy for reconciling the two great philosophers; and its detailed and intricate deployment of Aristotle's theory of categories.²⁴ This is the second passage to which I shall return (pp. 22–7).

²² Ptolemy's negotiation of the question whether an effect must always fall into the same category as its cause is slippery and not altogether satisfactory, as Porphyry will point out with some relish. I shall say a little more about this later.

²³ If Porphyry had thought that the qualitative character of difference in pitch altogether disqualified Ptolemy's mathematical approach, his commentary would have been virtually pointless. But he did not; as he notes at 88.1–7, it is still legitimate to treat the qualities as supervening upon quantitative distinctions which are the causes underlying them, and the business of mathematical harmonics is with the relations between these quantities.

²⁴ There has been much discussion in recent decades of Porphyry's interpretation and uses of the *Categories*, his attempts to integrate it with Plato's doctrines and the extent to which his views about it can be harmonised with those of Plotinus. See e.g. Evangeliou (1988); Ebbesen (1990):145–90;

There are few free-standing philosophical passages in I.4–5; material of interest to philosophers is closely integrated into discussions of issues specific to harmonic theory. I.4 contains several further passages on the definitions of important terms and on the various ways in which theorists had used them, including a particularly interesting discussion of proposed definitions of a note, *phthonggos* (86.1–87.19). The chapter also offers reflections on the respects in which pitch is both unlimited and limited in range and divisibility, and on the senses in which a note is both unified and divisible. But its most philosophically substantial passage (83.1–85.33) is a discussion of continuity and discontinuity, both in general and in the special context of sounds as they move from one pitch to another, where ‘continuous’ movement – usually conceived as involving an unbroken glissando between pitches – is characteristic of speech, and ‘discontinuous’ movement, leaving spaces (intervals) between distinct and stable pitches, is characteristic of melody. Like all such discussions after the fourth century BC, and there are many, it draws on Aristoxenus’ classic account in the *Elementa harmonica*. But it modifies and supplements it in interesting ways, notably in its treatment of the continuous form of movement, where it offers some curious examples, and apparently vacillates over the question whether sounds that move between pitches in this way remain steady on a definite pitch for no time at all, or for a length of time that has duration but is too small to be perceptible, or indeed for a length of time in which we can and do perceive its steady pitch.²⁵

Porphyry’s main topic in I.5 is the concept of ratio (*logos*), which is of course fundamental to the mathematical form of harmonics. After briefly introducing the subject with quotations from the *Sectio canonis* and from Euclid’s *Elements*, he moves on into a five-page study of the relations between ratio and two other pivotal concepts, those designated by the terms *diastēma* (‘interval’) and *hyperochē* (literally ‘excess’). A *hyperochē* can be thought of, very roughly, as the amount by which one term exceeds another, or more roughly still as the difference between two terms; but those formulations are not adequate to capture Porphyry’s normal usage; and the matter is further complicated by the fact that both he and other writers use the word in several significantly different senses. (I spell out these complexities more fully in [Section 8](#) below.) Nor are they always

Hadot (1990), (1999b); Sorabji (1990): 1–2; De Haas (2001); Fazzo (2004): 8; Chiaradonna (2004); Karamanolis (2004), (2006): 312–22.

²⁵ See further [Section 5\(d\)](#) below. There is a comparable uncertainty in another context at 30.19–31.21 – though perhaps it can be resolved – in a passage quoted from Heraclides.

consistent in their uses of the word *diastēma*, or in the relations that their usages imply between a *diastēma* and a *logos*.²⁶ Porphyry is well aware that writers' applications of these terms differ (though he does not always alert us to variations in his own), and armed with an array of quotations from a wide selection of sources he does his best to clarify the distinctions and to analyse and classify the various usages. His discussion is sometimes confusing and possibly confused, but it is nevertheless illuminating, and at the least it should stand as a warning that in the mathematical sciences as in others, the connotations of technical terms are not always the same and not always consistent with the definitions assigned to them, even when they are being used by eminent specialists.

In musical contexts *diastēmata* are musical intervals, some but not all of which are concordant. Notes bounding concordant intervals mark the outlines and the main internal divisions of harmonic structures. Detailed analysis of these structures in mathematical harmonics begins from the study of the concords, coupled with the identification of the ratios corresponding to them; it subsequently works out the sizes or ratios of the smaller, non-concordant intervals between their boundaries by dividing the ratios of the concords in mathematically appropriate ways. (Thus it does not proceed additively, by quantifying small intervals first and then using them as building-blocks in the construction of larger systems.) Ptolemy's chapter sets out on this enterprise by discussing the Pythagoreans' ways of addressing it. Hence after his study of ratio, interval and *hyperochē* Porphyry moves next to a discussion of concordance and the ways in which previous writers had represented and defined it; and from there he goes on to elucidate Ptolemy's account of the procedures used by the Pythagoreans for deriving and classifying the ratios of concords, and for placing them in an evaluative hierarchy.²⁷ He ends his discussion of I.5 by quoting the first sixteen propositions of the *Sectio canonis* insecurely attributed to Euclid, on the grounds that it will serve to clarify the whole contents of Ptolemy's chapter and to fill gaps which its account of Pythagorean doctrine had left.²⁸

²⁶ For discussion of this issue see Raffa (2013).

²⁷ In the commentary on I.6, in which Ptolemy criticises the Pythagoreans' approach to these issues, Porphyry presents a careful description (107.15–108.21), derived ultimately from Archytas, of a procedure by which earlier Pythagoreans constructed such a hierarchy. It is an important passage, partly because Porphyry records the procedure clearly and objectively, as Ptolemy does not, and especially for its evidence that the procedure was used by Pythagoreans of the early fourth or the fifth century BC, of whom we know all too little.

²⁸ Both Ptolemy and Porphyry regard the *Sect. can.* as a Pythagorean text. See further Section 5(a) below.

Two passages of special philosophical interest(a) *II.I–I5.29*

This section of I.1 has attracted a good deal of attention in recent years.²⁹ Its importance has been especially emphasised in studies of Porphyry by Riccardo Chiaradonna. He has highlighted and discussed its unusual combination of a Platonist commitment to the theory that knowledge is already present in the soul prior to any investigation, waiting to be uncovered,³⁰ with an intricate and fundamentally Aristotelian analysis of the stages on the route from an initial instance of sense-perception to the awakening of perfect understanding;³¹ its articulation of a theory in which transcendent and immanent universals are ‘two different levels in the same hierarchy of being’;³² the ways in which it addresses and illuminates passages in Porphyry’s other writings; and its connections with the work of Alexander of Aphrodisias.³³ These are fascinating themes, but I would like to take the discussion in another direction by bringing it back to its context in the commentary, which wider-ranging studies have tended to leave in the shadows.

The statement that attracts these five pages of discussion is at *Harm.* 3.3–5: ‘The criteria of attunement are hearing and reason (*logos*), but not in the same way; hearing judges on the basis of the matter and the attribute, reason on the basis of the form and the cause.’ After a few preliminaries, Porphyry focuses first on what the ‘ancient writers’ say about the relations

²⁹ The most detailed analysis of it is Tarrant (1993): 108–47. He examines its contents with care and insight, but scholars have not generally accepted his contention that the bulk of it is quoted or paraphrased from Thrasyllus, or closely based on his work; see e.g. Lautner (2007): 84 n. 23. We can at least be sure that the quotation from Thrasyllus beginning at 12.21 does not continue far, if at all, beyond the point at which Düring took it to end (12.28). Porphyry uses the formula introducing the quotation (‘as So-and-so says’) only for short quotations; long ones are always introduced by complete sentences. He also tells us explicitly where long quotations end, either with a statement such as ‘That is what So-and-so says’ (e.g. 26.4–5, 28.27, 36.3, 51.1, 77.19–20), or by some other explicit indication that the quotation has finished (e.g. 46.14, 47.24, 57.24, 67.11, 93.18–19, 103.26).

³⁰ This has affinities with Plato’s theory of *anamnēsis*, ‘recollection’, but Porphyry does not refer to it in those terms. Mueller (1990): 479 asserts that his account of the activation of *nous* by *epistēmē* ‘remains “Platonic” because the activation is a stimulation to recall rather than an implanting of something new’; but there is no allusion to ‘recalling’ in the text, and nothing that directly implies it.

³¹ Cf. also Karamanolis (2006): 311–12.

³² For partial anticipations of Porphyry’s position in Seneca and Alcinous see Chiaradonna (2007c): 36. On p. 46 he draws some particularly striking and controversial conclusions. ‘Immanent forms are Aristotelian forms impressed by the *logos* on matter. Their actual subsistence in matter is a “corporealization”: they do not exist as incorporeal in the physical world. . . . Abstraction is something like a “dematerialization” of the immanent forms. . . . The abstraction of the form in the soul is not an image resulting from the empirical observation of similarities, but it is *the form itself* de-materialized and “stored” in the soul’ (author’s italics). For a contrary interpretation see Karamanolis (2004): 107.

³³ See especially Chiaradonna (2007a), (2007b), (2007c); for other discussions see his bibliographies.

between reason, sense-perception, form and matter. They say that not everything judged by reason is judged also by perception, but everything judged by perception is judged also by reason. What both of them judge is form, since the form of a perceptible object is apprehended not only by reason but by perception too; reason grasps only the immaterial form by itself, while perception grasps it in its association with matter – it is ‘of the form as enmattered (*enhylon*)’ (11.13). There are, correspondingly, three modes of definition, all of which are concerned in one way or another with form (here he draws directly on Aristotle): some definitions specify only the form, some bring together the form and the matter, and some specify only the matter, but the matter conceived as potentially receiving the form (the last of these, which Porphyry attributes to the Stoics, now drops out of sight).

Ptolemy’s text suggests no connection between perception and form, and Porphyry does not say that he subscribes to these ‘ancient’ doctrines; but he plainly implies that they provide a clearer understanding of Ptolemy’s view. The suggestion is well founded. It is essential to Ptolemy’s methodology that the forms which reason grasps accurately and represents mathematically should be the same items as those which the hearing grasps ‘in rough outline’, that the impressions of sense-perception can be corrected under the guidance of reason, and conversely that in appropriate cases perception can provide evidence that reason has gone astray.³⁴ Then it follows immediately that if what reason finds in the realm of perceptible things is form, form must also be accessible to perception, even though it is presented to each of the two faculties in a different way. Ptolemy does not say this; the manner in which he contrasts perception and reason seems to imply, in fact, that perception makes no contact with form. But without the contribution made by the doctrines that Porphyry records, it is hard to see how Ptolemy’s methodology can make sense.

When Ptolemy says that reason (*logos*) judges ‘on the basis of’ (*para*) the cause as well as the form, he means that the cause is one of the things that human reason can identify. But here again Porphyry takes a different path. He tells us that according to the ancients, *logos* is the judge of perceptible things not only ‘as’ (*hōs*) the form but also ‘as’ – that is, as being – the cause (12.5–6); and he continues with this theme to 13.14. He explores the concept of the ‘*logos* in nature’, which imposes form on matter and organises the material things in the universe, and which is in some way ‘imitated’ in the reasoning of the soul, adding a quotation from Thrasyllus (12.21–8) which

³⁴ See Barker (2000): 14–32.

encapsulates these ideas. The quotation ends by saying that our intelligence (*nous*) ‘makes an impression of what a thing is and demarcates and confirms the essence of each thing, which is expressed by the *logos* that defines and the *logos* that demonstrates’; and this propels Porphyry into a discussion of the difference between a definition and a demonstration. It is an extremely difficult passage which I shall not try to anatomise. The salient point here is that what ‘the *logos* that demonstrates’ introduces between a major premise and a conclusion is a statement of the causal connection between them; and given that our reasoning – the activity of the *logos* within us – imitates the activity of the *logos* in nature, this reinforces the thesis that this *logos* has the character of a cause.

In this case too Porphyry has taken us well beyond the immediate implications of the lemma on which he is commenting, but again without seriously misrepresenting Ptolemy’s intentions. Ptolemy does indeed hold that our reason can grasp the form and order of things in the universe *because* it is reason that has given them form and order. In I.2 (5.20–4) he tells us that ‘the works of nature are crafted with reason and with an orderly cause, and . . . nothing is produced by nature at random or just anyhow, especially in its most beautiful constructions, the kinds that belong to the more rational of the senses, sight and hearing’; and in III.3 he discusses at some length the relations between reason’s causal and heuristic functions. It is perhaps unlikely that he subscribed to every detail in this part of Porphyry’s discussion, but for Platonist readers it would serve well as an intelligible expansion of his views.

Porphyry now introduces the passage that seems most distant from Ptolemy’s themes, either in I.1 or elsewhere in the *Harmonics*. Ptolemy says nothing about the process through which we pass between the perception of a phenomenon and a rational understanding of its form, except that the principles we draw on in reasoning towards this understanding must remain faithful to the doctrine about the works of nature to which I have just referred. For Porphyry, on the other hand, the business of intellectually detaching a thing’s form from the matter in which reason has embedded it, and then receiving it into the soul, is very complex, and he proposes to analyse it in order, he says, to make clear how our judgements are brought to completion (13.19–21). The account that follows at 13.24–14.6 is unmistakably Aristotelian in conception, analogous but not identical to the ones presented in *Posterior Analytics* II.19 and more allusively in *Physics* I.1. It identifies in sequence the functions performed at each stage in the progression and in some cases names the faculties responsible for them. There is nothing unusual about this in itself; the Stoics had devised their own

adaptations of the Aristotelian scheme, and others before Porphyry, including Platonists, had also co-opted Aristotle's strategy for similar purposes.³⁵ But Porphyry's version has complexities not found elsewhere.³⁶

Five stages are involved: (i) an 'apprehension' (*antilepsis*) arising from sense-perception (*aisthēsis*), which introduces the form into the soul; (ii) 'opinion-based supposition' (*doxastikē hypolēpsis*), which identifies the form by name and in this sense says what it is; (iii) imagination (*phantasia*), a faculty with at least three functions: it represents the form in a graphic, quasi-perceptible way, it checks the accuracy of the likeness it has created, and it stores the form away in the soul in the guise of a 'concept' (*ennoia*); (iv) the condition of knowledge (*epistēmē*), which comes into being when the concept is 'firmly established'; and finally (v) *nous*, conventionally translated as 'intelligence', but envisaged as a direct, non-discursive awareness of true reality. It arises from *epistēmē* 'like light ignited from a leaping fire', a simile that suggests a sudden enlightenment. Porphyry offers no further explanation.³⁷

Several of the details in this account are hard to interpret, and are complicated by the fact that the summary with which Porphyry follows it (14.6–14) does not tally in all respects with the original version. The difficulties are especially acute in the case of *phantasia*, whose roles are remarkably diverse; they seem to overlap with those assigned to it by Aristotle (*De anima* 427b–429a) and by the author of the *Didascalicus* (4.13), but to include others as well.³⁸ It does not appear in Aristotle's description of the ascent to knowledge in the *Posterior Analytics*. Porphyry's representation of it may owe something to the intricate debates of Hellenistic Stoics,³⁹ but

³⁵ The Platonist version closest to Porphyry's is probably that of Alcinoüs (or Albinus – the writer's identity is disputed) in *Didascalicus* 4; see particularly 4.8–14. The passage is translated and discussed in Sharples (1989): 235–40. Cf. e.g. Alex. Aphr. *De an.* p. 66 Bruns, Sext. Emp. *Pyrroh. hyp.* II.70–8, Ptol. *De judic.* 2.4 Huby and Neal = vol. III.2, p. 5 Lammert, Plut. *De an. procr.* 1024E–1025A.

³⁶ Some of them seem to arise from a fusion of conceptions drawn from Plato with those of Aristotle. For an example see Sheppard (2007): 74 on *doxa* and *hypolēpsis*.

³⁷ On the passage setting out these five stages see especially Chase (2010), who however treats the emergence of the concept (*ennoia*) as a distinct stage, and therefore identifies six. As well as analysing the doctrines of the passage, he sheds a good deal of light on the sources from which it is derived, showing convincingly, for instance (389–90), that stages (ii)–(iii) originate in Plato *Philebus* 39a–c, arguing at length (392–5) that much of Porphyry's account – and especially the stage involving *ennoia* – is closely related to Theophrastus fr. 301A Fortenbaugh, and identifying (396) Porphyry's statement about *nous* as a fusion of Aristotle's account of it with Plato *Seventh Letter* 341c–d. For an earlier analysis (on which Chase comments) of 13.24–14.14 and the problems it poses see Tarrant (1993): 120–30, which also includes suggestions about its relation to other sources.

³⁸ For a study of *phantasia* in Porphyry see Sheppard (2007), and on the whole topic of *phantasia* in Greek philosophy see Waters (1988).

³⁹ See e.g. Sext. Emp. *Adv. math.* VII.49, Diocl. Magn. *apud* Diog. Laert. VII.49, Alex. Aphr. *In Ar. de anima* 72.5 Bruns.

from a conceptual point of view its complexities are evidently due, at least partly, to its position as a kind of pivot between the stages linked closely to sense-perception and those that deal with concepts and pure forms alone.⁴⁰ In order to mediate between them it must somehow operate in both these spheres.⁴¹

Ptolemy's enterprise, for all its mathematical abstractions, aims at the analysis of empirical phenomena, and it is they that provide its starting-points. It is unsurprising, then, that a philosopher like Porphyry, deeply influenced by Aristotle's writings, should feel the need to explain how the workings of the human psyche can bridge the gulf between sense-perception and rational understanding of what is perceived, and that his account should follow an Aristotelian pattern. Its intended relevance to the context set by the opening lemma – that is, Ptolemy's association of reason with form and cause – is brought out clearly in the sequel (14.14–28). 'What happens is like this', says Porphyry (14.14–15), meaning 'what happens by means of the process I have just described is as follows'. He depicts it through the image of an incised design on a ring which impresses its form on a piece of wax (this corresponds to the causative action of reason, which gives the form corporeality), after which the raised design in the wax is impressed on another piece of matter to create a replica of the original (this is the reception of the form by the soul, once again detached from its bodily setting).⁴² After a few more lines elaborating these thoughts (14.21–8), he prefaces a brief summary of the principal doctrines of *Harmonics* I.1 with the confident assertion that what he has been saying explains them (14.29–15.9).

But there is one last twist in the passage. Porphyry inserts into the summary I have just mentioned the statement that whereas sense-perception

⁴⁰ In this role, *phantasia* played a significant part in Byzantine controversies in the period of iconoclasm. Those who championed sacred images as accessories to worship were often accused of idolatry. Their own contention, however, was 'that icons were a sort of window to holiness, which is why they felt the need to preserve *phantasia* as a space in-between corporeality and mental abstraction' (Pizzone 2012: 45).

⁴¹ Mueller (1990): 479 says that *phantasia* 'does not copy sense impressions exactly, but introduces accuracy into the images and presents them to the soul as *ennoiai* (concepts)'. This is a fair précis of Porphyry's account, but it incorporates the problem rather than resolving it. What are we to make of the transition between (accurate) images, which Porphyry describes in terms of painting and sculpture, and *ennoiai*, which he identifies with forms?

⁴² As an anonymous reader kindly reminds me, the ultimate source for the use of the image in this context is clearly Aristot. *De anima* 424a17–24. In the image the matter to which the form is transferred from the wax is of course corporeal; by contrast, its counterpart in the soul still counts as 'matter' for the reception of form, but it is incorporeal matter. See 13.15–19. Porphyry's remarks at 13.29–32 and uses made of similar imagery by the Stoics suggest that the incorporeal replica is constructed at the stage of *phantasia*; cf. e.g. Diog. Laert. VII.46, Diocl. Magn. *apud ibid.* VII.50, Philo *Quod deus sit immut.* vol. 2 p. 64.1–6 Wendl, Alex. Aphr. *In Ar. de an.* 68.11, 72.5 Bruns.

judges by being affected by something else, reason ‘turns out to have grasped *in advance* the whole thing that is judged, as if it *contained in itself* the form of the object of enquiry, and does so more accurately than when the investigation focuses on perceptible objects’ (14.33–15.4). This plainly takes us back into Platonist territory, and Porphyry brings his picture vividly to life in the long analogy with which the passage ends (15.10–29). Reason is like a king who always stays in his palace, but who knows everything accurately in advance of any external information. The senses are his spies and messengers, who go out into the world and bring back reports of what they take themselves to have observed. Their reports are rough and sketchy, but the king, ‘since he knows everything in advance, does not merely learn what has been reported, but learns also whether the messenger has presented it inaccurately, and learns, in short, the whole constitution of what has been indicated to him’. When Porphyry unpicks the analogy he adds a further point: reason ‘takes from perception as much as perception can report, and by itself discovers (*heuriskei*) what is accurate, *making perception, too, more accurate* through the latter’s association with it’ (15.26–8). He goes on to tell us that Ptolemy ‘presents these points when he writes as follows, immediately after the passage we have discussed’, and this introduces the next lemma.

The statement at 15.26–8 corresponds perfectly to what Ptolemy says. Reason is a ‘discoverer’, and when it has made its discoveries sense-perception will readily accept correction and fall in line with its conclusions (see especially *Harm.* 3.14–4.7). On the other hand the idea that human reason contains knowledge in advance of enquiry is not in Ptolemy; it seems to be Porphyry’s Platonist interpretation of his position, and at first sight it seems to fit uncomfortably with the depiction of reason as *discovering* truths. But there need be no tension between them. When Porphyry comments later on Ptolemy’s representation of reason as stable and autonomous by contrast with the instability of sense-perception, he attributes to ancient authors, with apparent approval, the thesis that it is ‘unimpeded in its activities’, and he interprets Ptolemy’s description of it as ‘autonomous’ as meaning that ‘it is self-sufficient for making the discovery which is its proper goal; for it is self-moved’.⁴³ There are obvious echoes here of Aristotle’s account in *Metaphysics* XII of the unmoved mover, engaged eternally in the activity of self-contemplation, with the difference that the divine mind is not moved or changed at all, even by itself; it and its activity are always exactly the same. Human reason, by contrast,

⁴³ 18.1–2, 10–12, cf. 11.13–16. The passage of Ptolemy is *Harm.* 3.14–20.

is not perpetually aware of all truths. It must search them out, but it is 'self-moved' and 'self-sufficient for making the discovery' without external assistance; and a Platonist would argue that this can only be the case if the truths are already built into it, inherent in its essence as reason.

Summarily, then, the passage we have been discussing holds together as a coherent sequence, and despite the distance it travels away from Ptolemy's text, none of it is irrelevant to the declared purposes of the commentary. Tarrant may be right to say that its treatment of the thesis that *logos* is a criterion in harmonics 'has certainly not been originally devised for the purpose of explaining Ptolemy's claims: Porphyry is adapting it for that purpose'.⁴⁴ If so, he could have adapted it either from some previous work of his own, or from a source or sources among the Middle Platonists; it is even possible, as Tarrant argues, that the source is Thrasyllus. I am not convinced that the case for regarding it as an adaptation is conclusive; but whether it is or not, the passage as a whole is very well suited for the task to which Porphyry has put it.

(b) 43.23–67.14

Porphyry's central purposes in this intricate passage are first to undermine the arguments by which Ptolemy tried to show that the differences between pitches of sounds are differences of quantity, and secondly to demonstrate that he was in fact wrong, and that they are differences of quality. Along the way, at 45.22–49.4, he brings the views of Plato and Aristotle into the picture, quoting *Timaeus* 67b–c and *De anima* 420a–b. In the main part of this discussion he interprets Plato as adopting the quantitative view; Aristotle, by contrast, on Porphyry's analysis, held that while the causes of high and low pitch are quantities and vary quantitatively, their effects, the attributes themselves, are qualities. Thus he takes Plato's position to be identical in the relevant respect with Ptolemy's, and Aristotle's with his own. Yet he implies at the beginning that their positions are identical, and at the end he argues that when suitably understood their apparently conflicting opinions can be reconciled. The whole passage revolves around the Aristotelian theory of categories, and can usefully be compared with Porphyry's discussions of it in other writings.⁴⁵

His critique of Ptolemy's reasoning is long and detailed, but in essence it takes the form of a dilemma. Its general shape can be sketched as follows

⁴⁴ Tarrant (1993): 110.

⁴⁵ The fullest discussion of this passage is in Karamanolis (2006): 257–66. His interpretation of it is radically different from mine, and I shall add a brief résumé of our disagreements at the end of this section.

(though I omit some steps that are essential for Porphyry's special purposes). Suppose, first, that Ptolemy maintains that an effect must always be in the same category as its cause, a principle that he strongly suggests at the beginning of I.3 (*Harm.* 6.14–18) and which holds good for many of the causes and effects he goes on to discuss. But in that case he contradicts himself at *Harm.* 7.17–23, where he says that although denseness, diffuseness, thickness and thinness are qualities, they are caused by quantitative features of the items which they characterise. This clearly contravenes the principle. In the next sentence he adds that the qualities of thinness and thickness in sound-producing objects cause high and low pitches respectively. But he has said that though thinness and thickness have quantitative causes, they themselves are qualities; and in that case there are no grounds at all for the inference that their effects, height and depth of pitch, are attributes that differ quantitatively. If we apply the principle in their case regardless of its contradiction in the other, we might equally argue that since the causes of differences in pitch are qualities, the differences themselves must be qualitative too. The second horn of the dilemma can be very briefly expressed. Suppose that Ptolemy does indeed intend to allow that a cause and its effect can be in different categories. On that basis, however, we can grant him the thesis that differences in pitch have quantitative causes, but he cannot conclude from this that they are quantitative themselves. Then whichever choice he makes, his argument fails.

I shall not review Porphyry's arguments for the view that pitch-differences in fact belong to the category of quality, interesting though they are (see 58.5–61.15, together with the quotations from Theophrastus and Panaetius that follow). They cannot be neatly summarised, since they address the issue from at least five different and independent perspectives, and the excerpt from Theophrastus poses a good many thorny problems of its own. I have tried to untangle some of their trickier details in my notes to the passage. Let us pass on at once to Porphyry's discussion of Plato and Aristotle.

He introduces it as follows. The ancient writers

asserted that swiftness is the cause of high pitch and slowness of low. And since swiftness and slowness consist in quantity, one might grant that quantity is the cause of high and low pitch. Yet from this it does not follow that high and low pitch belong to the class of quantity; whereas if he [Ptolemy] had not represented swiftness as the cause of high pitch, but had said that the high itself is swift and the low itself is slow, as Plato and Aristotle thought, the high and the low would indeed belong to the class of quantity, since the swift and the slow are quantities. (45.22–30)

This plainly implies that Aristotle and Plato agree that height and depth of pitch belong to the category of quantity, but difficulties arise when Porphyry examines their views more closely, on the basis of what they actually say. After quoting *Timaeus* 67b–c, he sets about correcting an important misunderstanding to which other Platonists had succumbed (46.3–47.8). They had imagined that Plato was not attributing swiftness and slowness to high and low pitches themselves but to the movements that cause them, whereas Plato's real meaning is the opposite. Plato says nothing about their causes, and he assigns swiftness and slowness to the attributes themselves. Porphyry concedes that it could be argued that the swiftness and slowness of movement which – in Plato's view – are identical with high and low pitch must in fact be caused by movements of corresponding speed, but insists that this is not a view that can be extracted from the text itself (46.24–30). He concludes that since swiftness and slowness are quantities, so too, according to Plato, are high and low pitch (47.8–12). Plato, then, does indeed adopt the view that he and Aristotle were said to share.

But what about Aristotle? Porphyry quotes *De anima* 420a–b and delivers the first part of his analysis of it at 47.13–48.12. He concludes (for good reasons) that the thesis of the passage is that although swiftness is the cause of high pitch and slowness of low, high pitch itself is not swiftness and low pitch is not slowness; and he continues:

Aristotle is contradicting Plato when he says 'It is not the case that the high is swift', and nor is the low kind of voice slow – for it is against him that these remarks are directed – but high pitch arises *because* of the swiftness of the movement involved in the impact, and low pitch *because* of the slowness of the impact, so that a high voice is produced when the air's movement is very swift, and a low one when it is slow. (48.12–17)

Nothing could be clearer. Aristotle is contradicting (*antilegōn*) Plato on precisely the point about which they were previously said to agree. Porphyry continues to elaborate Aristotle's position for another ten lines, leaving no possible doubt that he construes it as differing radically from Plato's. Aristotle assigns pitch a quantitative cause but denies that pitch itself is a quantitative attribute, whereas Plato asserts that the attribute of pitch is quantitative, while saying nothing relevant about its cause.

At this point, however, Porphyry springs another surprise.

There is a difference between thinking of an attribute as the cause and the agent and thinking of it as that which is caused and acted upon. Aristotle says that the attribute [i.e. swiftness] is the cause, and because of this the swiftness of the impact of the air, which was said to be the cause of

the sound, produces its high pitch [lit. 'sharpness'].⁴⁶ The sharpness in tangible things, on the other hand, in a piece of iron, for instance, which was said to be the cause, makes the swiftiness; and the same goes for heaviness and bluntness. Plato, however, holds that the attribute is that which is caused: 'when the voice is swift it is high ["sharp"], and when it is slow it is low ["heavy"]'. But if, as Plato says, as the agent acts, so that which is affected is affected, and conversely, the attributes arising in what is caused would pre-exist actively in the cause; and in this way the two philosophers would speak with one voice. (48.26–49.4)

The first sentence of this passage encapsulates the distinction on which the whole of Porphyry's argument depends. We are dealing here with two completely different theses, one concerned with the nature of a certain attribute, the other with that of its cause. The next three sentences summarise the results he has extracted from Aristotle's and Plato's statements: Aristotle's thesis is of the latter type, attributing swiftiness and slowness to the causes of high and low pitch, while Plato writes in the former vein, assigning them to the pitches themselves. So far this is fully in line with the arguments that Porphyry has developed over the previous three pages. But the last sentence is very puzzling. It purports to offer a way of reconciling the two philosophers' positions, which would in effect confirm the impression given at 45.27–9, that they both accept that 'the high itself is swift and the low itself is slow'.

In the light of Porphyry's efforts to integrate Aristotelian and Platonic thought elsewhere in his writings, he might have found this a satisfying conclusion. But here it is anomalous and wholly unconvincing. Suppose, first, that we accept the principle attributed to Plato: 'as the agent acts, so that which is affected is affected, and conversely'.⁴⁷ In that case, since Aristotle has represented the cause (or agent) as acting in a way that is differentiated quantitatively, he will have to agree that the effects of these differentiations differ quantitatively too. Yet Porphyry has just argued at length that Aristotle emphatically denies this conclusion, and in a later passage he repeats the point with evident approval (58.5–16). Secondly, Porphyry is in no position to accept Plato's principle, since he not only attributes to Ptolemy the thesis that qualities can have quantitative causes but explicitly subscribes

⁴⁶ The regular Greek term for 'high-pitched' is *oxys*, literally 'sharp'; for 'low-pitched' it is *barys*, 'heavy'. The words' literal senses are relevant here; Aristotle says that they are transferred to sounds from their original application to tangible things, and his discussion draws attention to both the similarities and the differences between the ways they apply in these two domains.

⁴⁷ For the passage of Plato to which Porphyry is referring, and for further comments, see nn. 170–1 to the translation.

to it and argues from it himself.⁴⁸ If he interprets the principle that ‘as the agent acts, so that which is affected is affected’ as meaning that cause and effect must belong to the same category – as clearly he must in the present context – he cannot adopt it without undermining the central thrust of his argument against Ptolemy’s contention that pitches vary quantitatively. Hence this attempt at a reconciliation between Plato and Aristotle is a miserable failure, and it is hard to believe that Porphyry had any faith in it; his remarks at 58.5–16 show that even if for a moment he did, he subsequently abandoned it. We may note that he expresses it only tentatively: ‘*if*, as Plato says, as the agent acts, so that which is affected is affected . . . the attributes arising in what is caused *would* pre-exist actively in the cause, and in this way the two philosophers *would* speak with one voice’.⁴⁹

I mentioned earlier (n. 45 above) that Karamanolis (2006) interprets the passage very differently. Summarily, he argues that Porphyry’s main objective is to show that despite their apparent disagreements, Plato’s view and Aristotle’s are in fact essentially the same, and that any remaining disparities are trivial. ‘This suggests’, he continues ‘that Porphyry in general may have admitted the existence of differences between the two philosophers and still have held that these differences do not undermine their essential agreement’ (258). To put it another way, he takes Porphyry’s ‘harmonising’ statements at the beginning and end of the passage as expressing Porphyry’s real view, and the intervening arguments as designed to explain away the apparent difficulties.

He arrives at this view, however, by assuming that the question on which Porphyry is focusing is about the way in which pitch and ‘qualities in general’ are produced, in other words that it is a question about the nature of their causes (258–9). But it is not. Karamanolis is mistaken in saying that at 47.10–11 Porphyry represents Plato as denying the Aristotelian view that there is a causal relation between speed and pitch (264); all that Porphyry says or implies is that Plato did not explicitly assert it. There is in fact no suggestion anywhere in the passage that Plato and Aristotle differ over this matter. The question at issue throughout is whether the attribute of pitch itself is quantitative or qualitative.⁵⁰ Karamanolis also

⁴⁸ See 44.28–45.3, 52.19–53.2, 58.5–16. Elsewhere he notes correctly that Aristotle also accepts the related thesis that an attribute may belong to more than one category: see Aristot. *Cat.* 11a and e.g. Porph. *In Cat.* 139.22–141.4 Busse.

⁴⁹ The phrases ‘would pre-exist’ and ‘would speak . . .’ represent constructions using the optative with *an*.

⁵⁰ Of the three passages which Karamanolis cites in support of his interpretation, 38.5–7 is irrelevant, and 45.17–20 and 49.5–8 are explicitly concerned with the categories to which height and depth of pitch belong, not with their causes.

contends that the thesis that ‘high and low pitch are essentially rapid and slow movements respectively (45.27–30) . . . is Plato’s view *and the one that Porphyry seeks to establish*’ (259, my italics). In the light of the fact that the enormous array of arguments and testimonies running from 43.23 to 67.14 is almost entirely dedicated to demolishing this position, this strikes me as an extraordinary remark; and when he goes on to say that the view he has mentioned ‘understands [high and low pitch] as quantities or, at least, qualities resulting from quantities’, he is clearly implying that in the present context the distinction between quantities on the one hand and qualities resulting from quantities on the other is of no importance. But in truth it is absolutely central to the debate. The principal arguments in Porphyry’s discussion of Plato and Aristotle are designed to highlight the difference between their positions, not to explain them away.

There are two substantial points on which Karamanolis and I agree. First, while believing that Porphyry’s attempt to reconcile Plato’s and Aristotle’s views is seriously intended, he too thinks it a failure, though for different reasons from mine (264–5). Secondly, I have no doubt that the overall thesis of his book is correct, that is, that one of the main aims of Porphyry’s philosophical endeavours was to integrate Aristotle’s work into the study of Plato, though I find less evidence for it in the *Harmonics* commentary than he does. He is also right to represent Porphyry as thinking that minor differences between the philosophers’ views need not prevent us from holding that they agree on ‘essential’ matters. But this leaves open the question what is essential and what is not; and that will depend on whether we are considering a doctrine’s status in the context of the debate in which it appears, or in the context of Porphyry’s broader philosophical concerns. In the present case the immediate issue is whether pitch is a quality or a quantity, and no doubt this question is fairly unimportant in the larger arena of Porphyrian thought. From that perspective the ‘essential’ agreement between the two need not be disturbed. In the immediate context, by contrast, nothing is more essential than this issue; the question is fundamental to Porphyry’s agenda, and he finds that their answers to it are radically at odds. Plato’s view about pitch is identical with Ptolemy’s, which Porphyry elaborately refutes; Aristotle’s, as Porphyry understands it, is the one he accepts and argues for, quoting Theophrastus and Panaetius at some length in his support. But he has explored the contrast between Plato’s and Aristotle’s opinions only for the sake of its bearing on his attempt to prove Ptolemy wrong, and we may perhaps conclude that he has allowed his enthusiasm for that project to override his more general conviction that Aristotle and Plato are – ‘essentially’ – singing from the same song-sheet.

5 The musicological content of the commentary

It can hardly be denied that much of the commentary's value to musicologists lies in its quotations from other writers, in its philosophical explorations of issues relevant to musical theory, and in such help as it gives in interpreting difficult passages in Ptolemy, but in this section I shall say little about any of these features. In particular, I shall not discuss the content of his best-known quotations (for instance those from Archytas, Plato, Aristotle, Theophrastus, the *De audibilibus* and the *Sectio canonis*). They have often been studied in the past, and I would merely like to encourage readers to take notice of the ways in which Porphyry uses them as well as the substance of what they say. Nor shall I attempt even a partial chapter-by-chapter summary of musicological topics, as I did for their philosophical counterparts in the previous section.

If we leave his philosophical reflections aside, Porphyry offers few thoughts of his own about musical matters. But among them are some that deserve close attention, as also do various passages in which he examines familiar concepts and ideas from unusual perspectives. The first subsection below comments on his representation of the two schools of thought in harmonics that dominate the discussions of Book I. The others pick out a selection of passages in which Porphyry provides unfamiliar musicological information or analysis, or faces us with unfamiliar problems.

(a) *Pythagoreans, Aristoxenians and others*

Porphyry tells us at the outset that the most important schools of thought (*haireseis*) in harmonics are those of the Pythagoreans and the Aristoxenians. There have been others in the past, he says, but 'because of their superficiality' they have almost entirely disappeared (3.1–12). Nothing in other texts of this period casts serious doubt on these remarks, but we need to be wary about how we interpret them. Who were the Aristoxenians to whom Porphyry refers, and did all of them follow Aristoxenus' doctrines to the letter? And how much is implicit in the word 'Pythagorean'? Varieties of Pythagorean philosophy and mysticism had become culturally and intellectually influential since their revival in the first century BC, not least in Platonist circles; Pythagorean ideas are very prominent, for instance, in the work of Porphyry's student Iamblichus. But it seems clear that in Ptolemy's *Harmonics* and in Porphyry's commentary alike, the term 'Pythagorean' is applied only on the basis of a theorist's approach to harmonic science, and implies nothing about his or her other intellectual commitments. Both

of them, for example, plainly regard the *Sectio canonis* (which Porphyry attributes to Euclid) as a Pythagorean text, though it betrays no philosophical allegiances of any substantial sort. It would be incautious, on the other hand, to go too far in the opposite direction, and assume that every writer who used the mathematical form of analysis characteristic of these Pythagoreans would automatically fall under the same description. Such analysis is fundamental to Ptolemy's work, but for Porphyry he is not one of the Pythagoreans, though 'in most respects he follows them' (9.1). Like the Pythagoreans, the theorist Didymus worked with the monochord and presented his divisions of the tetrachord as sequences of ratios, but neither Ptolemy nor Porphyry calls him a Pythagorean,⁵¹ nor do they attach the label to Eratosthenes, who also expressed his divisions in terms of ratios.⁵² And though both Plato and Aristotle made liberal use of propositions in mathematical harmonics, Porphyry certainly regarded neither of them as a Pythagorean (Ptolemy does not mention them).⁵³

The cases of Plato and Aristotle are unproblematic. Porphyry certainly knew that Aristotle had rejected the Pythagoreans' musical metaphysics and that Plato had criticised their treatment of harmonic theory; and in any case we would not expect him to represent them in terms that imply their intellectual subordination to any previous thinker or school of thought (except in so far as he regards Aristotle's work as partially dependent on Plato's). To place Ptolemy among the Pythagoreans would be equally absurd, given his trenchant criticisms of their views and Porphyry's determination to portray him as judiciously combining the best insights of both harmonic traditions.

It is less clear why these authors withhold the title 'Pythagorean' from Didymus and Eratosthenes. Two kinds of consideration may have a bearing on the matter. One is chronological. Ptolemy gives the title to only one named individual, Archytas,⁵⁴ and the only musical theorists named and described as Pythagoreans by other writers of the period are also figures from the fifth century BC and the early fourth, most notably Hippasus and Philolaus. I have commented that Ptolemy and Porphyry implicitly treat the *Sectio canonis* as a Pythagorean document and that Porphyry ascribes it to Euclid. But he mentions Euclid several times and never calls

⁵¹ They call him 'Didymus *ho mousikos*', 'Didymus the specialist in music'. For his treatment of the monochord and his tetrachordal divisions see Ptol. *Harm.* II.13–14.

⁵² Ptol. *Harm.* II.14.

⁵³ A theorist with strong philosophical commitments to Pythagoreanism, Nicomachus, represents Plato as following directly in the path of the Pythagorean Timaeus of Locri (*Harm.* II, 260.16–17 Jan); but even he does not describe Plato as a Pythagorean.

⁵⁴ Porphyry seems reluctant to call even Archytas a Pythagorean; see n. 61 below.

him a Pythagorean, and his treatment of the *Sectio* probably reflects the impression that it is a compendium of Pythagorean propositions, not that its author was a Pythagorean theorist himself. Perhaps, then, the designation is reserved exclusively for the theorists of the early period.

But that cannot be the whole answer. Ptolemy plainly represents himself as confronting Pythagorean views that were current in his own time, and Porphyry explicitly contrasts the Pythagorean and Aristoxenian *haireseis* with those that had failed to survive. In that case, given the restricted range of named theorists to whom the term ‘Pythagorean’ is attached, we may guess with some probability that the unspecified contemporary Pythagoreans are those who continue to subscribe to positions that the early theorists had adopted. If so, they must have been identified by the methodological principles they brought to their investigations. Ptolemy comments on various errors committed by Pythagorean theorists, but his most general criticism is that they rely too exclusively on reason and improperly disregard the evidence of hearing. Ptolemaïos of Cyrene depicts them in the same way in passages quoted by Porphyry in I.2. Ptolemy, by contrast, is committed to the thesis that the conclusions to which reason leads us must be submitted to the verdict of sense-perception, and that if it conflicts with those conclusions we must admit that something has gone wrong in our reasoning. Propositions in harmonics cannot be regarded as scientifically established unless the two criteria are in perfect agreement.

If the chronological consideration were decisive by itself, there would be no mystery about the reason why Eratosthenes and Didymus are not called ‘Pythagorean’. If we apply the methodological criterion, on the other hand, there must have been something about their conduct of the science which detached them from the Pythagorean *hairesis* and perhaps connected them more closely with Ptolemy’s position. We know too little about Eratosthenes’ studies in harmonics to be sure whether this holds of him or not, but a meticulous study of the evidence by David Creese suggests that it probably does.⁵⁵

The case of Didymus is more complex. Creese’s examination of Ptolemy’s reports about him leads him to conclude that Didymus’ innovative ways of using the monochord (Ptol. *Harm.* II.13) were designed only to display the results of his mathematical reasoning, not to test them; they ‘involved *epideixis* without empiricism’.⁵⁶ If that were true it would distance him from

⁵⁵ Creese (2010): 178–209. Though he does not focus directly on this issue, his conclusions tend to support the hypothesis that Eratosthenes gave serious weight to empirical evidence as well as to abstract mathematical reasoning.

⁵⁶ Creese (2010): 291. For his discussion of these aspects of Didymus’ work see 288–92.

Ptolemy and bring him closer to the Pythagorean ‘rationalists’, whom Ptolemaïs also identifies with the *kanonikoi* or ‘monochord-users’ (22.22–23.9). But Creese’s arguments are not conclusive, and we cannot ignore Porphyry’s startling and enigmatic assertion at 5.11–13, that Ptolemy borrowed repeatedly from Didymus’ work without acknowledging the fact. There is no evidence that it bears directly on the point at issue here, or that it does not, but if there is any truth in it Didymus’ work cannot have fitted smoothly into a ‘Pythagorean’ mould.

He stands out from the general run of mathematical theorists in at least two identifiable ways. First, Plato’s harmonic construction in the *Timaeus* has the form of a diatonic scale whose tetrachords are divided into two intervals of a tone of ratio 9:8, plus the so-called *leimma* in the ratio 256:243. Philolaus may have adopted this division before him,⁵⁷ and it is the only division presented in the great majority of relevant later sources (e.g. *Sect. can.*, Thrasyllus, Adrastus, Theon, Plutarch, Nicomachus). In view of its ubiquity among mathematical theorists and its Pythagorean or quasi-Pythagorean origins, its adoption might well have struck Ptolemy and Porphyry as one of the trademarks of Pythagorean harmonics.⁵⁸ Ptolemy, however, articulates principles which entail that all the single scalar steps into which a tetrachord is divided must have ‘epimoric’ ratios, that is, ratios which in their lowest terms have the form $n+1:n$, a rule contravened by the ratio of the *leimma*. His methods also dictate that no two ratios in a given division can be equal, another principle breached by the *Timaeus* system. In these respects Didymus’ divisions are in line with Ptolemy’s and not with those of the tradition stemming from Philolaus and Plato; apart from Ptolemy himself he is the only theorist known to have followed the rule about epimoric ratios consistently.

Secondly, the title of the work by Didymus from which Porphyry quotes, *On the difference between the Aristoxenians and the Pythagoreans*, implies that its main purpose was not to expound its author’s own contributions to the science, but to compare the theories of the two major schools of thought. Porphyry’s allusion to Didymus at 3.13–14 and the passages he quotes at 26.6–28.26 fit squarely into that agenda, and the passage paraphrased at 107.15–108.21 is also a report about the procedures of others (in this case Pythagoreans), not of ones adopted by Didymus himself. All this material is presented in tones of detached objectivity, and he gives no sign of aligning

⁵⁷ See Huffman (1993): 149–50, Barker (2007): 268–9, 272–5.

⁵⁸ But this cannot be directly confirmed. When Ptolemy mentions this division in *Harm.* 1.16, he does not represent it as a brainchild of Pythagorean theorising but as a practical musician’s anomalous (though forgivable) deviation from theoretical correctness.

himself with the Pythagoreans; from the evidence of 26.6–28.26 one might indeed judge that he found more food for thought in Aristoxenus' ideas than in theirs. He may, then, have been a writer who gave his own harmonic constructions only a minor role in his work and devoted most of it to researches in the science's history; hence he could not be neatly docketed as a Pythagorean or an Aristoxenian, or as the founder of a *hairesis* of his own.⁵⁹

The term 'Pythagorean' seems therefore to be reserved for two groups of harmonic theorists. There are first the early pioneers in the tradition stemming from Pythagoras himself, which was generally thought to have ended with Archytas. By this criterion Archytas would naturally have been thought of as a Pythagorean theorist, and is regularly called a Pythagorean in the later sources,⁶⁰ even though his methods and the form of his harmonic divisions distance him significantly from the post-Platonic Pythagorean consensus.⁶¹ The second group are those of any date who relied (with some minor qualifications) on mathematical reasoning alone in the construction of their systems, whose divisions did not assign epimoric ratios to all scalar intervals and typically followed the pattern laid down in the *Timaeus* and the *Sectio canonis*, and who used the monochord and the evidence of the ear only to put their constructions on display, not to submit them to experimental tests.

In the opposite corner we have the Aristoxenians. Broadly speaking, they are characterised by their doctrine that harmonics is concerned only with audible sounds as such, and not at all with their physical causes; by their representation of musical intervals as quasi-linear distances between points, not as ratios between quantities; and by their insistence that all the principles of the science must be grounded in the evidence of sense-perception and not of abstract reasoning. Reasoning still has a significant role in their project, but its main task (as in Book III of the *El. harm.*) is

⁵⁹ Despite the importance with which Porphyry credits him, he includes no '*hairesis* of Didymus' among those listed at 3.6–8.

⁶⁰ In his own period he is assimilated to the Pythagoreans when his harmonic theories are under discussion, but not in other contexts: see Huffman (2005): 8.

⁶¹ Porphyry's treatment of Archytas is intriguing. He was well known as a member of the early Pythagorean tradition, and Ptolemy describes him as 'of all the Pythagoreans the most dedicated to the study of music' (*Harm.* 30.9–10). But when Porphyry comments on this passage he describes him in a phrase whose natural sense is not that he *was* one of the Pythagoreans but that he came *after* them (139.13); yet at 56.2–3 he follows the normal practice and calls him 'Archytas the Pythagorean'. Perhaps his ambivalence about giving him the title reflects his recognition that when Ptolemy, Ptolemaïis and Didymus discuss Pythagoreans in general, their remarks apply principally to the 'rationalists' of my second group, and that Archytas' work in harmonics had very little in common with theirs.

to draw out and demonstrate what follows from the principles, once they have been empirically established.

All these aspects of their approach are prominent in the *El. harm.*, together with others that Porphyry also discusses, and it is clear that when Ptolemy and Porphyry refer to 'the Aristoxenians' they almost always have Aristoxenus himself primarily or even exclusively in mind. Porphyry quotes from his writings repeatedly, and cites no other Aristoxenian source,⁶² and neither author mentions any other Aristoxenian by name.⁶³ But both of them regard Aristoxenian harmonics as a living presence in their own time, and in two passages (130.28, 137.13) Porphyry follows Ptolemy in referring to contributions made or errors committed by 'the more recent Aristoxenians'.⁶⁴ In several other cases (e.g. 95.13–19) he clearly has contemporary Aristoxenians in mind, though he does not say so explicitly.

These hints about Aristoxenians in the imperial period are tantalising, since we know very little about such people,⁶⁵ and it is not just Ptolemy and Porphyry who name no individual Aristoxenian theorists. Many Latin and Greek writers from the Hellenistic period onwards show at least an elementary knowledge of Aristoxenian thought, but none of them names any Aristoxenian authority except Aristoxenus himself. The fact that this knowledge was so widespread, and that the writers never mention the sources that provided it, points to the conclusion that the 'more recent Aristoxenians' exerted a pervasive cultural influence, but did not convey their views in writing. My best guess is that they were primarily school-teachers. Writers may also have supplemented their instruction through conversations with professional musicians, who could naturally discuss their art in Aristoxenian language, whereas for their purposes the concepts and terminology of mathematical harmonics were virtually useless. Both the influence and the anonymity of contemporary exponents of Aristoxenian harmonics would be readily explained if the subject was regularly taught in schools, and there is little doubt that it was. Several of the little 'handbooks' of harmonics (e.g. those of Cleonides, Bacchius and

⁶² Two short phrases giving alternative Aristoxenian definitions of a note are quoted anonymously at 86.8–10; they both differ slightly from one offered at *El. harm.* 15.15–16, and probably represent later attempts to improve it.

⁶³ What Porphyry tells us of Arcestratus at 26.27–27.16 seems to align him loosely with the Aristoxenian tendency, but he does not call him an Aristoxenian. At 3.6–7 he implies that he founded a *hairesis* of his own.

⁶⁴ Both these allusions, despite their brevity, preserve information which is not found elsewhere.

⁶⁵ Cleonides' *Harmonics* and Book I of Aristides Quintilianus are largely compendia of Aristoxenian doctrine, and they are our best sources for material that is not in the surviving texts of Aristoxenus himself. But they give only tiny scraps of information about later developments in the tradition.

Gaudentius) were evidently designed as school texts,⁶⁶ and at least two relevant passages of Porphyry's commentary (83.25–84.5, 95.13–19) depict scenes in the classroom or the lecture-hall. Music-teachers must themselves have been taught by musicians, and the innovations attributed to 'more recent Aristoxenians' by Ptolemy and by Aristides Quintilianus seem likely to have been prompted by practical rather than purely theoretical considerations; they were probably introduced by professional performers, in order to incorporate new developments in performance and composition into the theoretical framework with which they were familiar.⁶⁷ Scholars like Porphyry clearly studied the writings of Aristoxenus himself as well as recalling what they had learned in school, but I suggest that it was through the school curriculum that modified forms of Aristoxenian theory reached them and others, and remained a live point of reference in educated circles. Some additional comments bearing on these issues are offered in subsections ζ (d) and ζ (e) below.

(b) *The monochord*

Most of the snippets of factual information that Porphyry offers without reference to earlier writings are slight and incidental, and show little more than general knowledge of a sort displayed by many writers of this period, specialists and non-specialists alike. But this is not true of his discussion of the monochord in I.8, where he follows Ptolemy's account faithfully, step by step, but also provides a good deal of detail that the *Harmonics* does not. One might not have expected this abstractly minded intellectual to have been so intimately acquainted with the instrument and its deployment, especially in its practical aspects, and the information he gives adds significantly to our knowledge.

He specifies, for instance, the materials of which the instrument and its bridges are made (wood for the instrument, horn for the bridges). He seems to imply that the first step is to draw precisely measured indications (lines and circles) on the surface of the instrument's sound-board, to mark the positions of its various other components – as a competent craftsman surely would. He is aware that the bridges should not be simply spherical, as one might incautiously (and wrongly) infer from Ptolemy's description,

⁶⁶ They were presumably intended to provide teachers with a framework for their lessons. It would have been much too costly to make copies of the texts and distribute them to the pupils themselves.

⁶⁷ The innovations involved new divisions of the tetrachord (Ptol. *Harm.* 29.9, repeated at Porph. 137.13), and the addition of two new *tonoi* ('keys') to Aristoxenus' set of thirteen (Arist. Quint. I.10, 20.5–9, cf. Ptol. *Harm.* 59.6–20).

but should be cylindrical ‘up to a certain point’; only the upper surface is a section of a sphere. He suggests a surprisingly large diameter (three finger-breadths) for their bases, and allows us to infer from this the instrument’s approximate width. He notes that the *kanonion* (the measuring-strip) used in association with it should be lighter and narrower than the instrument, and a little longer than the sounding-length of the string; and he describes how it is to be marked out and associated with the string with meticulous attention to the minutiae, as if guiding the hand of a novice at every step along the way.⁶⁸ All this encourages the conclusion that he had himself been trained in the instrument’s use, or at least had learned very carefully how others constructed and used it, and that he thought it important that his readers should thoroughly understand the procedures. But though his apparent expertise enables him to elaborate Ptolemy’s account substantially, nothing he says is at odds with it. So far as the texts can show, there is no difference between Ptolemy’s monochord and the instrument that Porphyry describes, or between the ways in which they expected it to be used. Their accounts differ only in so far as Porphyry tells us a good deal more. We may reasonably infer that the version of the monochord with which Ptolemy was familiar, his procedure for testing the string’s properties, and so on, were not peculiar to him or his immediate milieu. Whether or not they had been widely used by students of mathematical harmonics in the second and third centuries, Porphyry knew them at first hand, and he evidently believed that they should be so used, especially, perhaps, by Neoplatonist and Neopythagorean philosophers.

(c) *The tonoi and the attunements of musical performers*

This example alerts us to the extent of Porphyry’s familiarity with some of the more practical aspects of a harmonic scientist’s activities. Problems posed by one of the commentary’s most difficult chapters may put us on the track of another dimension of his musical knowledge. In II.1 Ptolemy supplements the theoretical account he gave in I.16 of the patterns of attunement used by contemporary musicians. What he now offers is a set of procedures for reaching the same conclusions on a more concrete basis. It involves tuning an instrument’s strings by ear, as a performer would, to each of the attunements that professional musicians used, and comparing one with another in certain rather intricate ways. To clarify the steps of the procedure, Ptolemy gives each of the attunements the

⁶⁸ On some of these points and on issues affecting geometrical precision see Creese (2010): 308–10.

name by which musicians knew it, and names the notes that each of them includes. Although the details of his constructions are almost unintelligible unless we also know in which *tonos* or ‘key’ each attunement is set, he does not identify the relevant *tonoi* here; he will specify them in II.16, after presenting his wider discussion of the topic in II.7–II. Porphyry, however, in his commentary on the passage, while occasionally mentioning the names that Ptolemy provides, makes a point of identifying each tuning by reference to the *tonos* in which it is set. Although, like Ptolemy, he has not previously discussed the *tonoi*, he apparently supposes that his allusions will be understood. This by itself might cause some surprise, since the concept of *tonos* is one of the most problematic and controversial in the harmonic theorists’ repertoire.⁶⁹ But it seems still stranger that the *tonoi* in which he places the attunements are different from those to which Ptolemy later assigns them (several of them do not figure in Ptolemy’s system of *tonoi* at all), and so are the names of their constituent notes.

The differences are too consistent and substantial to be the result of carelessness or scribal confusion; and so far as I am aware, the only scholar who has found a plausible explanation for them is Stefan Hagel.⁷⁰ I cannot go into its intricacies here, but the gist of it is this. The system of *tonoi* which Ptolemy describes and defends in *Harm.* II.8–II was eccentric even in its own time. It was motivated by theoretical considerations which – in Ptolemy’s view – dictate the proper purpose and form of a system of keys, and it is quite different from the set of *tonoi* that musicians actually used. His system and theirs differ in the number of *tonoi* they recognise, in the names by which they designate them and in the identity of the *tonos* which counts as the basic or central key.⁷¹ On the other hand there is no good reason to doubt the accuracy of his analyses of the forms of attunement the musicians used,⁷² even though they might have been puzzled by the peculiarities of the system of *tonoi* into which he absorbs them in II.16.

Porphyry implies, however, that this group of attunements had not survived unaltered into his own time. ‘On the contrary’, as Hagel remarks, ‘he seems to infer that the practice of Ptolemy’s time was quite different’ from that of his own musical milieu.⁷³ We might therefore be tempted

⁶⁹ For a clear exposition of its main features see West (1992): 228–33, and cf. e.g. Barker (1989): 16–27 and (2007): 215–28.

⁷⁰ Hagel (2009): 61–5. Readers should note that this discussion cannot be well understood in isolation from – at least – the rest of the chapter in which it appears.

⁷¹ For a brief but more carefully nuanced account see Hagel (2009): 56–61. Ptolemy is a major presence in Hagel’s book, however; see his Index of Personal Names for further references.

⁷² On this point see Barker (2000): 150–5, 255–8.

⁷³ Hagel (2009): 63, cf. 65.

to guess that his strategy was not merely to avoid using the attunements' names (which had by now become meaningless or misleading) as the main indicators of the attunements' identities, clarifying his descriptions instead with references to the *tonoi* in actual use. Perhaps, one might suppose, he was trying to recast Ptolemy's account in such a way that it no longer described the same forms of attunement, and corresponded instead to ones that chimed with the practices of his own contemporaries. But this hypothesis is untenable, since he makes it quite clear that it is Ptolemy's attunements that he is trying to describe. The *tonoi* in which he has placed them are those which people 'most commonly used to employ' (156.9); and Hagel argues that the past tense, 'used to employ', must imply that they are ones which had been regularly used in Ptolemy's time but had little or no place in the practice of his own contemporaries. What he was attempting, in Hagel's opinion (if I understand him correctly), is to represent the attunements used, according to Ptolemy, in second-century Alexandria, but to do so in terms with which his own third-century contemporaries – perhaps primarily in Rome – were familiar, that is, by reference to structures which played essential roles in their own conceptions of key-relations.

At the end of his passage on Porphyry, Hagel notes that his interpretation leaves certain problems unresolved. That is true, but if it is on roughly the right lines (as I believe it must be), we can conclude that Porphyry's musicological knowledge extended beyond anything he could have gleaned from Ptolemy himself, or from the other sources he cites in the course of his commentary. He knew that Ptolemy's account of the *tonoi* was out of step with those of the musicians of the period in which the *Harmonics* was written, and with the views of the theorists of that period; and he knew enough about the ways in which his own contemporaries represented the *tonoi*, and the theoretical framework in which the attunements they used were embedded, to tackle the task of elucidating Ptolemy's analyses in II.1 in a way which his readers would find intelligible.

(d) *Continuous and intervallic sound*

As Aristoxenus represents it, a 'continuous' sound (or a continuous 'movement of the voice', in Aristoxenus' language) is one that slides up or down in pitch without staying on any one pitch for a perceptible length of time; a 'divided' or 'intervallic' sound is one that moves through a sequence of determinate pitches, coming to rest on each of them and separating them by intervals over which it passes instantaneously and in silence. Almost all later discussions of the distinction are based on the account given by

Aristoxenus,⁷⁴ and the writers repeatedly tell us, as he does, that the former is used in speech and the latter in music. Though they often abbreviate his exposition and sometimes use different terminology, they rarely modify it in ways that significantly affect the sense. Ptolemy's treatment is at *Harm.* 10.5–18; Porphyry tackles it twice, at 9.34–10.27 and 83.1–85.33 (to which 86.1–87.19 is also relevant). His discussions have different purposes: the first presents the views of the Aristoxenians, while the second is designed to elucidate Ptolemy's exposition. They are not wholly consistent with one another, and each of them has intriguing quirks of its own.

The 'Aristoxenian' account departs in several unusual ways from the one presented in the *El. harm.* First, its description of a continuous sound gives as one of its defining features the rapidity and haste with which it moves between pitches (10.5, 10, 20–7), whereas Aristoxenus says nothing to suggest that the movement's speed has any bearing on the matter.⁷⁵ The fact that Porphyry's Aristoxenians apparently thought it relevant is indeed rather puzzling, since the distinction between the two forms of movement, as it is represented elsewhere, hangs only on the manner in which a sound's pitch changes and not at all on the speed at which it does so. Again, there is no fixed line to be drawn between quick and slow, and if very quick movement makes a sound continuous and very slow movement makes it intervallic, there will presumably be an intermediate range of cases in which it cannot definitely be said to be either. But in other sources the distinction is regularly treated as absolute – a sound's movement is either continuous or intervallic, and there are no intermediate cases in which its status is ambiguous.⁷⁶

Secondly, Porphyry reports the Aristoxenians as asserting that the pitches between which an intervallic sound moves are separated by silences (10.14–16). But this is something that Aristoxenus explicitly contradicts: in respect of time, he says, the movement is continuous – that is, there is no temporal gap between its departure from one pitch and its arrival at the next.⁷⁷ Here again Aristoxenus' version seems preferable, at least if we take into account his repeated insistence in this passage that he is speaking only of the phenomena as they appear to sense-perception. We can at any rate

⁷⁴ *El. harm.* 8.13–10.20.

⁷⁵ The speed, *tachos*, of these transitions is also mentioned in Arist. *Quint.* I.4, at 6.1 Winnington-Ingram.

⁷⁶ This is not entirely accurate; a few writers mention an intermediate form of movement, but it is rarely discussed, and never characterised by reference to the movement's speed. See especially Arist. *Quint.* 5.24–6.7, which describes it as a combination of the other two forms of movement, and says that people use it when they read poetry aloud.

⁷⁷ *El. harm.* 8.27–30.

agree that there *need* be no detectable periods of silence between the audible pitches of an intervallic sound, and hence that there should be no reference to such silences in a definition of this mode of movement.

We should not conclude, however, that these divergences from Aristoxenus arise from mere misunderstandings, either on Porphyry's part or on that of the anonymous Aristoxenians whose views he is recording, since the passage contains a clue which allows us to interpret them in a less critical spirit. After discussing the two forms of movement, Aristoxenus mentions that the intervallic form is proper to singing and the continuous form to speech, but he does not elaborate further. By contrast, Porphyry's report on the Aristoxenians draws attention to their different roles right at the start, and he devotes nearly half the passage (10.15–27) to graphic descriptions of certain faults that can creep into speech and musical performance; they do so when the way in which the voice moves between pitches in either mode of performance approximates too closely to the form of movement proper to the other. People who stammer and break up their speech into fragments are behaving more like singers – and, he says, we criticise them for it – and although musicians who sing very fast may believe that they are doing something skilful and splendid, they in fact disgrace themselves by coming too close to the mode of performance appropriate to speech.

This account focuses attention, then, not just on the nature of the two forms of movement, as Aristoxenus does, but also on certain specific kinds of case in which they occur; and by condemning these occurrences on aesthetic grounds it steps outside the familiar business of describing the movements' characteristics and offering examples. But there is no reason to suppose that Porphyry is reporting the Aristoxenians' views inaccurately, or that he is misrepresenting their attitude when he uses the distinction as a basis for evaluative judgements. Let us assume that these Aristoxenians are later representatives of the tradition, as they must be if Porphyry's report is reliable. Then if the hypothesis I suggested above is on the right lines, they will be teachers – in this context specifically singing teachers, and perhaps also teachers of elocution. In that case the association of an objective distinction with criticisms of modes of performance becomes perfectly natural. A student who has set himself the goal of singing as quickly as possible must be reined in, and this might well be done by showing him that he is aiming at something inappropriate to the art he is trying to master. After all, a student's efforts at performing very rapid runs are indeed likely to degenerate into slithering glissandi, whose musical undesirability the teacher can explain by appeal to the distinction between the two forms of vocal movement. Rather similarly, though the suggestion that the distinctly

pitched notes of a musical performance should be separated by silences is theoretically anomalous, such separation makes sense as a technique for students to practise, to inculcate in them the otherwise unfamiliar habit of giving each pitch clean boundaries, avoiding any audible contact with the pitches between them. A teacher of elocution or rhetorical delivery, by contrast, would wish to discourage his students from breaking their utterances up into discontinuous fragments.

Porphyry does not criticise these Aristoxenians' views directly, but in the passage at 83.1–85.33, where he discusses and writes approvingly of Ptolemy's account of the distinction, the two major peculiarities we found in the Aristoxenian exposition have disappeared. The continuous form of movement is examined at length and copiously exemplified, but this time the speed of its transition between pitches is apparently deemed irrelevant, since Porphyry says nothing about it; and he explicitly denies that the pitches of what he now calls a 'divided' sound must be separated by moments of silence. Such sounds, he says, are not those divided by silences, but those whose constituent pitches are clearly defined and do not run together; they are like patches of pure colour set side by side (85.6–9). In these respects at least, the position he (correctly) attributes to Ptolemy is much closer to that of the *Elementa harmonica* than the one previously attributed to the Aristoxenians.

His expansion of Ptolemy's short discussion and the interpretations he puts on unfamiliar features of Ptolemy's terminology are by and large faithful to the original and helpful as guides to its meaning. But there is independent food for thought here too. In the first place it begins, as no other passages on the subject do, with a brief study of continuity and discontinuity in general (83.1–10), thereby assimilating the specialised musicological contrast between 'continuous' and 'divided' sounds to debates that had been on-going among philosophers since the Presocratic era, prompted from the fourth century onwards especially by discussions in Aristotle's *Physics* and *Metaphysics* and fuelled by controversies between Epicureans and Stoics. I shall argue in [Section 7](#) below that Porphyry intended his commentary primarily for the instruction of philosophers, and this is a compact example of the efforts he makes to integrate musicological with philosophical thought.

It is interesting, too, that he devotes a surprisingly large proportion of the passage (83.13–84.29) to the topic of continuous sound, that is, to the kind of sound that has no place in music. No other musical theorist pays it so much attention. But some programmatic statements much earlier in the commentary explain why Porphyry thought it proper to treat it at

greater length. Harmonics, he says, is primarily concerned with the nature of sounds that are musically attuned, but also, secondarily, with those that are not; and it studies not only intervallic sounds but also those that are continuous, in order to distinguish the former as clearly as possible from the latter. 'For in general,' he continues, 'all branches of knowledge and all skills apprehend not only the things in their own domain but also those round about them, though they deal with the former primarily and with the latter subordinately' (6.17–29). Hence a careful study of continuous sound is not inappropriate to the subject. In fact, however, his abstract statements about it are fairly perfunctory. Most of the passage is occupied with examples, some of them quite graphically and elaborately developed, notably in his description of the sound of the 'trumpets that mark the hours' (83.19–24) and his heart-rending vignette of a singing-student's desperate efforts to pitch the note that his teacher had given (83.25–84.5). These examples are not found in our other sources, and it seems likely that they are based on Porphyry's personal experience.

A particularly intriguing issue emerges from Porphyry's treatment of one of Ptolemy's analogies. Ptolemy says that sounds whose pitch changes continuously are those 'the locations of whose movements in each direction are not clearly apparent, or of which no single part is equal-toned over a perceptible interval of time, as with what happens to the colours of the rainbow' (*Harm.* 10.6–8). He apparently regards the two formulations as alternative definitions of the same phenomenon; they are not linked by the word 'and', which would indicate that a continuously changing sound must satisfy both conditions, but by the word 'or', which identifies the definitions as alternatives. Yet they plainly are neither logically nor empirically equivalent. In a sound whose movements from pitch to pitch are indistinct or blurred, there could, consistently with the first definition, be stretches of time in which the pitches themselves – those between which these movements take place – remain stable and clearly identifiable. But that would be inconsistent with the second definition. Porphyry too seems to notice no difficulty in the relation between the two definitions. He repeats the second, 'of which no single part is equal-toned over a perceptible interval of time', at 84.21–2; and in explicating it he says that in sounds of this sort there is in fact a part that is constant in pitch for a certain length of time and a part that is changing, but that this is 'not made clearly apparent'. This curious suggestion, which is not in Ptolemy, does not resolve the problem. Ptolemy's first definition still leaves open the possibility that the pitches between which the movements take place are perceptibly stable. Porphyry compounds the difficulty when he picks up

Ptolemy's analogy. The case of continuous sounds, he says, is like that of the rainbow, in which the various colours are *perceived* as being constant over a certain distance. It is only their boundaries that are indistinct and blend into one another in a way that sense-perception cannot grasp (84.20–8).

In the rainbow, as Porphyry describes it, we do see each colour as staying constant over a certain area, and it is only the boundaries between the colours that are blurred. In the corresponding case, then, as he says in the preceding lines, there will be lengths of time during which the sound's pitch remains perceptibly the same; but the pitches blend into one another at the edges, and it is impossible to detect any exact point at which one of them ends and the next begins. This thesis is plainly at odds with the second part of Ptolemy's statement, in which no part of the sound maintains a steady pitch for any perceptible length of time. It also seems inconsistent with what Porphyry says himself at 83.17–18 and again at 84.3–5, where his remarks imply that there are no periods of time at all – whether they are perceptible or not – in which such a sound stays steadily on one pitch. On the other hand what Porphyry says about the rainbow itself seems perfectly accurate. When we look at a rainbow its colours appear in stripes each of which has a definite hue over most of its area, but whose edges are indistinct and blurred; and we might reasonably suspect that it is Porphyry's own observations of rainbows that have enticed him into this elaboration of the analogy, that he has allowed them to shape his thesis about continuous sounds, and that he has failed to notice its dissonance both with Ptolemy's second way of defining these sounds and with his own previous statements.

But this is not the end of the matter. Three pages later, at 87.9–13, in one of the rare cases where he criticises Ptolemy explicitly, Porphyry complains that his definition of a note as a sound that maintains one and the same pitch is inaccurate, since it will also include 'continuous vocal sound' and 'the parts of simple sounds that are not produced melodically'. What he means by 'continuous vocal sound' (or 'voice', *phonē*) becomes clear immediately; the phrase refers to the enunciation of spoken words, the paradigm case of 'continuous' sound; one can apply Ptolemy's definition, he says, to the high-pitched and low-pitched syllables of a spoken word. He offers no argument in support of this contention, presumably because its truth would be obvious to anyone who listened to the contours of speech; and we must apparently conclude that in the spoken Greek of Porphyry's time, the syllables maintained stable pitches over some perceptible part of their duration, while shading into one another at the edges like the colours of the rainbow. We may note that Aristides Quintilianus defines continuous sounds only by reference to the vagueness of their transitions

between pitches and says nothing to suggest that the pitches between which they move are themselves unstable; that Bacchius represents the pitches between which the sounds of speech move as *phthonggoi*, notes; and that in an earlier period Dionysius of Halicarnassus had described each spoken syllable as being ‘placed on’ (*tattomenē epi*) a high or a low pitch.⁷⁸ All these are consistent with Porphyry’s picture of Greek speech, and those of Porphyry, Bacchius and Dionysius are incompatible with the description given by Aristoxenus, which denies to the pitches of spoken utterance any moments of stability at all. Porphyry’s evidence is the most clear cut, and with the support of the others it suggests rather forcefully that the way in which Greek was spoken changed in this respect at some time in the period between Aristoxenus in the late fourth century BC and Dionysius in the first; for another suggestion, see Barker (forthcoming): 136–7.

(e) *Melody as ‘broken sound’*

Porphyry returns to the distinction between continuous and intervallic sounds in the course of the next passage, where he examines various definitions of a note, *phthonggos* (86.1–87.19). Among them are two Aristoxenian definitions, both of which say, in part, that a note is the incidence of a voice (or sound) on a pitch. But the word I have translated as ‘incidence’, *ptōsis*, means literally a ‘fall’; and at 86.16–24 Porphyry offers some curious comments on this usage. Continuous sounds, he says, as it were stand firm; but intervallic sounds do not stay upright, and by being broken and falling they become melodic. Just as a tree that stands upright is in a sense continuous, whereas one that is broken by a gale falls, so a continuous sound is upright and unbroken, and sounds become melodic when they have fallen in ruins.

By describing continuous sound as firm and upright, and intervallic sound as broken, collapsed and wrecked, Porphyry seems to represent the former as sound in its correct or perfect condition and the latter – the one required in melody-making – as lamentably damaged. This strikes a very harsh note in the context of musical theory; and in the statements I have paraphrased, Porphyry gives no indication that his descriptions are based on anything but his own reflections on the word *ptōsis*. But in the middle of the passage (86.19) he inserts another brief remark: ‘that is why they call

⁷⁸ Arist. Quint. 5.26–6.2, Bacch. 69 (307.11–14 Jan), Dion. Hal. *De comp. verb.* 11. Cleonides (*Harm.* 2, 180.13–16 Jan) incorporates both of Ptolemy’s definitions, but unlike Ptolemy he implies that the movement of a continuous sound, identified with that of speech, must satisfy both conditions: it ‘makes its rises and falls in pitch indistinctly, standing still nowhere until the point of silence’.

melody “fragmentation of the voice (*klasis phōnēs*)””. This is most naturally taken to mean that the phrase ‘fragmentation of the voice’ was a common description or definition of melody; and Porphyry may have intended to imply that the remarkable picture he has painted was one regularly used to explain the familiar phrase.

The difficulty is that we have no other evidence that melody was commonly called ‘fragmentation of the voice’, and only one pitifully inadequate indication that the phrase was ever used in this sense. The only other passage that uses a phrase of this sort to refer to melody in general, or to the kind of vocalisation involved in melody as such, is in the collection of fragments known as *Excerpta neapolitana* (at 413.2–4 Jan), a source of unknown date and dubious authority. Quite probably its remark is a mere echo of Porphyry himself. In other writers such phrases always refer to melody of a particular, highly modulated sort, and always in tones of disapproval.⁷⁹ LSJ finds the sense that Porphyry gives it in certain passages of Philo of Alexandria, and his usage at *De posteritate Caini* 106.1–2 might indeed be thought to resemble Porphyry’s. But this would be a mistake; it too refers specifically to complex and modulated melody, and so do the occurrences at *Quod deus sit immutabilis* 25.2–4 and *De sacrificiis Abelis et Caini* 23.4–5.

Porphyry’s depiction of intervallic sound here is strikingly unorthodox, and we may be inclined to dismiss his statement at 86.19 as simply untrue. But it can be read in another way. Perhaps when Porphyry says ‘they call melody “fragmentation of the voice”’, without specifying who ‘they’ are, he is not referring to people in general, but only to those whose theories are currently under discussion. In that case they must be the Aristoxenians, since it is an element of their definitions that has provoked this excursus. If we accept my hypothesis that Porphyry’s Aristoxenians (other than Aristoxenus himself) were not writers but teachers or performers, the absence of written examples of the usage becomes less mysterious. They might also, perhaps, have been responsible for the allusions to wrecked and fallen trees and so on; one can imagine a teacher using such colourful analogies in the classroom. I think this may be the right interpretation, but it does not completely solve the problem. If what Porphyry says had been regularly current in schools of the period, we would expect some examples of it to have found their way into the surviving literature on melody and the differences between melody and speech; much has of course been lost, but we still have plenty of it. A fully satisfying solution remains elusive.

⁷⁹ See e.g. [Plut.] *De mus.* 1138c, Philo Alex. *De agricultura* 35, Schol. in Aristoph. *Nubes* 969c, 971d, Sext. Emp. *Adv. math.* VI.15.

In this section I have tried to highlight some of the commentary's musically interesting passages other than those contained in Porphyry's quotations. Of course the latter must take pride of place, but in the past Porphyry's own contributions have been unduly neglected. The examples I have offered are only a selection, and readers who examine the whole text will certainly find more.

6 The circumstances in which Porphyry's commentary was composed

The question, considered in [Section 7](#) below, why Porphyry not only studied Ptolemy's *Harmonics* but also published a commentary on it is bound up with another, more general issue. In what circumstances is such a commentary likely to have been composed, and what did its 'publication' involve? The hypothesis I want to propose draws heavily on the work of William Johnson, and especially on his recent book *Readers and Reading Culture in the High Roman Empire* (Johnson (2010)). He does not discuss the genre of commentary, but some of his rich and fascinating observations and conclusions suggest plausible ways of envisaging the processes through which commentaries, including Porphyry's, were constructed and disseminated.

Johnson shows that around major writers of the period he considers, Pliny the Younger, Tacitus, Galen, Aulus Gellius and others, there gathered groups of people anxious to establish their credentials as members of a cultural elite by joining in learned discussion under a distinguished intellectual's leadership. Such gatherings were common, in some cases almost daily, sometimes over a meal and sometimes in other situations. The basis for discussion was typically provided by a book, which might be a new work by the group's leader or another contemporary author, or an acknowledged literary or scholarly masterpiece. This was read aloud to the group. But in Pliny's circle, for instance, the book was not read right through before discussion began; instead, after a short passage, perhaps just a single sentence, the reading would pause, and the group's leader would discourse on the passage's linguistic, literary, philosophical, historical, scientific and other qualities, and on problems and issues that it addressed or provoked. In Pliny's entourage, again, though not in all others, it was expected that his associates would also contribute to the discussion when the master⁸⁰ had

⁸⁰ We may note the use of the word *didaskalos*, 'teacher', to designate the principal figure in an erudite group of this sort, for instance the patron and host on the (no doubt fictional) occasion described in [Plut.] *De musica* (1131B, E, 1146C, D). It is obvious that the context is not that of a formally constituted educational establishment.

finished, especially by offering apposite quotations from other sources and elaborating on their significance. It was in this way that they confirmed, to themselves and others, the legitimacy of their claim to the elite status that membership of the group conferred.

This seems a very likely model for the process through which a commentary was constructed and developed. Most commentaries, Porphyry's included, take precisely the form described: short excerpts from the work being read, each followed by learned discussion of issues arising, often studded with quotations from other sources. It is clear that in later life Porphyry was the central figure in a close-knit group of intellectuals; and whether or not the group was formally constituted as a 'school' with Porphyry at its head, it seems very probable, given the wealth of evidence that Johnson has compiled, that the procedures they adopted replicated those of the 'reading communities' that he examines. In that case, though the bulk of the commentary was probably the product of Porphyry's own solitary studies, just as the magisterial pronouncements of other groups' leaders formed the principal part of their discussions, we cannot exclude the possibility that some of it – and perhaps some of its more puzzling diversions and incongruities – arose from interventions by other members of his circle.

When discussion in such groups was focused on a new work, not as yet publicised beyond the group's boundaries, part of its function from the author's point of view was to show him whether it was likely to be well received if it were released to a wider readership. If he decided in its favour, dissemination of this sort sometimes, at least initially, took the form of a recitation of the work in a larger, more public gathering; but this seems unlikely in the case of a commentary such as Porphyry's. Beyond or replacing that starting-point, as Johnson says, "Publishing" (*emittere, edere*) was simply the offer to let others copy your literary work without stipulating that they keep it to themselves.' The author might also promote it more positively, by dedicating it and presenting a copy to some influential person who – he hopes – will encourage his own friends and associates to take note of it; in the first line of his commentary Porphyry dedicates his work to a certain Eudoxius (whose identity is unknown), and he may have had similar motives. Since there were no publishers who acted as 'gatekeepers' (Johnson's expression), determining which books would see the light of day, the extent of a work's exposure depended entirely on whether people outside the author's immediate circle decided to have copies made and to let others read them – and perhaps to re-copy them too. The outcome was obviously beyond the control of the author, but membership

of one of the groups would improve his chances; ‘the only clear route to recognition as an author was by attachment to, and promotion by, one of these circles’.⁸¹

I can offer no direct evidence that Porphyry’s commentary was built upon the reading and discussion of Ptolemy’s text along with a circle of associates. Perhaps we can detect a loose parallel in the impression that Porphyry gives of procedures adopted in the group around Plotinus, for instance in *Vit. Plot.* 18. But if my hypothesis is anywhere near the truth, we might tentatively draw four main conclusions. First, it increases the probability that the commentary is a product of the later part of Porphyry’s career, when he held the dominant position in his group. Secondly, its contents may not all have emerged directly from his own fund of learning and his own reflections; other members of the group may have made significant contributions. Thirdly, it need not have been composed with a view only, or mostly, to the instruction of people formally enrolled as Porphyry’s students, if indeed he had any; he may have intended its presentation to the group, in a preliminary form as *viva voce* comments inserted between readings of Ptolemy’s text, primarily as a step along the route to its wider dissemination. But finally, the scenario presupposes that the members of his circle would have considered an examination of Ptolemy’s *Harmonics* a worthwhile enterprise, and perhaps one to which they themselves might have something to contribute. This last conclusion leads us to the topic of my next section.

7 The purposes of the commentary

Why did Porphyry write a commentary on a musicological text, and what kinds of reader was he hoping to enlighten? We know, of course, that Plato had prescribed harmonics as one of the mathematical disciplines that potential philosophers should study, and that Neoplatonists in general took a lively interest in musical theory;⁸² Porphyry tells us that Plotinus himself had a sound grasp on the subject.⁸³ But philosophers (or apprentice philosophers) setting out on harmonic theory for the first time would not have been well served by a scholarly and sophisticated commentary on an outstandingly difficult text, and I think that Porphyry must have had some other purpose in mind.

⁸¹ The quotations and much of the content in this paragraph come from Johnson (2010): 52–3.

⁸² Cf. e.g. Gersh (1992): 141.

⁸³ *Vit. Plot.* 14: ‘He had a thorough theoretical knowledge of Geometry, Mechanics, Optics and Music, though it was not in his temperament to go practically into these subjects’ (tr. MacKenna).

When we consider the demands the commentary makes on its readers, the following points stand out. First, they must be capable of appreciating intricate philosophical arguments and of recognising their relevance to significant debates; and a remark at 53.2–3 indicates that Eudoxius, to whom the commentary is addressed – and who must be broadly representative of its intended readership – had the competence to assess and develop Porphyry’s arguments for himself. Secondly, they must be capable of following fairly complex mathematical arguments. But Porphyry seems to credit them with less expertise in this field than in philosophy, since (as we see for instance at 145.7–146.25) they are not expected to be able to fill arithmetical gaps in the reasoning for themselves.

Thirdly, they must already know a good deal about harmonic and acoustic theory, at least enough to understand the conceptual framework within which Ptolemy and Porphyry are working, to follow their discussions intelligently, and to grasp the connections between their contentions and those of the other writers whom Porphyry quotes. We have already noted that they must also have some acquaintance with the ways in which contemporary musicians talked about the details of their art. Finally, and I think significantly, Porphyry seems to assume that they need particularly careful guidance about the ways in which the Aristoxenian and Pythagorean approaches to harmonics differ, about the epistemological, methodological and occasionally ontological positions to which each commits itself, about their respective merits and deficiencies, and about the importance of Ptolemy’s achievement in bringing together the best features of both, while avoiding the pitfalls into which each of them stumbles (4.12–16).

The hypothesis which I think fits these facts best is that Porphyry wrote his commentary for the use, above all, of philosophers engaged in studies of Plato’s *Timaeus*, in particular for those who concerned themselves with the interpretation of his account of the harmonic structure of the World Soul (*Tim.* 34b–36d). This may seem a perverse suggestion, since Porphyry pays little attention to the dialogue in this work and quotes an excerpt from the passage on the World Soul only once, briefly, at 92.12–18;⁸⁴ and he makes no allusion to the vigorous debates it had aroused on great issues in metaphysics, theology and human psychology. But I think the proposal is worth considering.

Philosophers from the generation after Plato onwards were fascinated by the *Timaeus* and by this passage in particular; discussions and exegeses

⁸⁴ One feature of the construction is mentioned later, at 115.27–116.1, but for Porphyry’s explanation of it we are told to consult his other writings; see p. 6 above.

proliferated, and not only among Platonists.⁸⁵ They may not initially have been formal commentaries, but the commentary mode was certainly established by the first century BC, and a substantial number of *Timaeus* commentaries had appeared before Porphyry's time, notably those of Thrasyllus, Adrastus and the writer whom Porphyry calls 'Aelianus the Platonist'. Plutarch's essay *On the Generation of the Soul in the Timaeus* is also in effect a commentary on the relevant part of the dialogue; so too, in large part, is the surviving remnant of Theon of Smyrna's *Mathematics Useful for Reading Plato*, in which extensive quotations from Thrasyllus and Adrastus are embedded. Porphyry wrote a commentary on the *Timaeus* himself, of which fragments survive, and the huge commentary of Proclus in the fifth century AD mentions several others written by Platonists in the intervening period. We can say with some confidence that the *Timaeus* was central to Platonist studies from the first century AD to the end of the Western Empire.⁸⁶

These commentaries and other writings did not confine themselves to the close examination of Plato's text. It becomes clear from the surviving passages that they incorporated large amounts of introductory material, initiating readers into the agenda, the conceptual apparatus and the basic content of established harmonic and acoustic theory. The long passage quoted by Porphyry (33.16–37.5) from Book II of Aelianus' *Commentary on the Timaeus* is a typical example. But there is an interesting peculiarity in the writers' treatments of this material, which can be seen in miniature at 35.14–17 in Porphyry's quotation from Aelianus and in scattered passages of Plutarch's essay, and much more extensively in passages quoted by Theon from the commentary of Adrastus. Of the two main schools of thought in harmonics, the Aristoxenian and the mathematical or Pythagorean, only the latter has any real bearing on the interpretation of Plato's text. Yet these commentaries place definitions, propositions and sometimes quite elaborate discussions drawn from Aristoxenian theory side by side with material on harmonics and acoustics in the mathematical tradition, and the writers give little indication that they conflict in significant ways. Adrastus, like other theorists, points out (on the basis of 'Pythagorean'

⁸⁵ Aristotle and Theophrastus were among the earliest writers on this theme; a later Peripatetic who also addressed it was Adrastus of Aphrodisias, around AD 100.

⁸⁶ Cf. Gersh (1992): 146: 'For a thinker trained in the school of Plotinus, the primary authority of the dialogues and especially of the *Timaeus* is a matter beyond controversy.' But we should note, as an anonymous reader reminds me, that not all the ancient discussions of the *Timaeus*, or of parts of it, took the form of lemmatic commentaries, and that the earlier works on the dialogue to which Proclus, in particular, refers may include writings of several different types, and perhaps even oral lectures.

mathematics) that the Aristoxenian interval of the ‘half tone’ cannot be exactly half a tone, but he treats the disagreement as a minor issue – one might argue, in fact, on the basis of Theon 71.19–72.20, that in his view it does no damage at all to Aristoxenian theory.

These commentaries’ accounts of existing harmonic theories are on the whole quite accurate, and philosophers scrutinising the *Timaeus* who worked with them at their side will have picked up a solid grounding in the subject. But so far as we can tell from the material that has come down to us, they would have learned nothing about the ways in which the two traditions conflict in principle, or about the weighty philosophical implications that a commitment to either of them brings with it. Porphyry finds in Ptolemy a theorist who addresses these issues in detail and at length, and in the earlier, most philosophically expansive parts of his commentary he places them squarely in the foreground. In his introduction he emphasises the importance of Ptolemy’s achievement in assessing the merits and defects of each position, though in the course of his discussions he takes care to highlight the fact that Ptolemy’s approach has much in common with that of the Pythagoreans, and to play down their disagreements. (Thus at 112.14–19, for instance, he does his best to explain a sustained passage of Ptolemaic criticism as aimed at only one small detail in Pythagorean theory, which it certainly is not.) He joins Ptolemy in his radical denunciations of the Aristoxenians, and enthusiastically elaborates what Ptolemy had said about the incoherence and the unacceptable consequences of their position.

I am not arguing, of course, that the commentary was designed with no one but students of the *Timaeus* in view. It also contains much that would have been interesting and challenging for philosophers working on other Platonic texts, on the relations between Platonic and Aristotelian thought and on the older philosophical tradition in general. Thus Porphyry’s comparisons of Aristoxenian and Pythagorean harmonics provide an illuminating point of entry into debates about the ‘criterion’ – that is, the basis on which judgements can reliably be made – and specifically about the relative status and the roles that should be assigned to sense-perception and to reason in the quest for truth.⁸⁷ The passages he quotes from earlier writers, together with his own reflections, make much more fine-grained distinctions than Ptolemy had done between existing views on these matters, and also lead naturally into wider issues in epistemology. Again, Neoplatonist philosophers would have found plenty of food for thought in the debate

⁸⁷ Ptolemy himself wrote a short work *On the Criterion*; see Huby and Neal (1989): 179–230. But it seems to connect only occasionally and tangentially with issues discussed in the *Harmonics* and in Porphyry’s commentary.