*Archytas of Tarentum: Pythagorean, Philosopher and Mathematician King* by Carl A. Huffman

Cambridge: Cambridge University Press, 2005. Pp. xv + 665. ISBN 0–521–83764–4. Cloth £106.00, $175.00

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The volume offers a full discussion of all the genuine fragments and *testimonia* ascribed to or concerning Archytas, the Tarentine mathematician and philosopher who is currently (and correctly) taken to have been one of the first thinkers who applied mathematical procedures to the investigation of natural phenomena. The book is divided into three parts. The first part [3–100] presents a number of introductory essays, organized in two broad sections—one about Archytas' life, his writings and the reception of his work; another about Archytas' philosophy—and concluding with a particularly valuable discussion of the authenticity of the received texts and *testimonia*. Huffman accepts as genuine the four fragments that scholarship has commonly ascribed to Archytas at least since Diels' and Kranz' collection [1951–1952, 1.47]. He devotes the second part to the discussion of these and related texts [103–252]. The third part presents the genuine *testimonia*, arranged into seven broad sections: life, writings and reception, moral philosophy and character, geometry, music, metaphysics, physics, and miscellaneous [255–594]. Two appendices contain a rather substantial discussion of the spurious writings and *testimonia* (actually a non-negligible portion of the writings ascribed to Archytas), and a short investigation about Archytas' name. A bibliography, a select index of Greek words and phrases, an *index locorum*, and a general index complete the volume. A rather appealing feature of Huffman's exposition, already tried in his preceding volume on Philolaus, is the absence of footnotes, except for the first part.

A typical discussion of a fragment and of some of the main *testimonia* has the following structure. The Greek text of the fragment or *testimonium* is presented with a critical apparatus; it is followed by


ISSN 1549–4497 (online) ISSN 1549–4470 (print) ISSN 1549–4489 (CD-ROM)
*Aestimatio* 4 (2007) 87–94

a translation and possibly by related passages, for which the Greek text (usually without apparatus) and translation are also provided. What then follows is articulated in sections concerning authenticity, context, the Archytan work from which the fragment could possibly have been extracted, and a number of items whose argument depends on the contents of the fragment or *testimonium* at issue. Under the heading 'context' one finds also very valuable textual discussions such as, for example, the one concerning the entangled question of the two versions of the text of Fragment 1.[1] The genuine fragments and some of the *testimonia* receive also a final, line-by-line commentary, where important textual issues are discussed in great detail and very well.[2] Huffman has checked the readings of the main manuscripts only for Fragments 1 and 2, namely, those coming from Porphyry's commentary on Ptolemy's *Harmonica*. As it turns out, Düring's standard edition of this work is in fact quite unreliable. In these cases, Huffman provides a text that is greatly improved with respect to that found in Diels' and Kranz' edition; in all other cases Huffman has relied on the best editions. As is clear from the extent of the volume, the discussion aims to be, and in fact is, exhaustive: this work will be a landmark of careful and serious scholarship, not only of Pythagorean scholarship, for many years to come.

I shall offer a few critical remarks focusing on the main *testimonium* of the geometrical achievements of Archytas, specifically, his striking method for finding two mean proportionals between given straight lines as reported in Eutocius' commentary on Archimedes' *De sphaera et cylindro* 2.1. Huffman reports this proof and supplements it, as a further *testimonium*, with Eratosthenes' account of the Delian problem, coming from the same source. Some of the remarks below, however, will possibly apply also to other fragments or *testimonia*.

There are several problems in the presentation of the Greek text of Archytas' method. One concerns the *sigla* adopted in the apparatus: they are in fact the ones employed in the standard edition of the Archimedean texts and Eutocian commentaries thereon, by J. L.

[1] The first is reported by Porphyry and the second, which is less extensive, by Nicomachus.

[2] The discussion of the use of Doric forms is a case in point.

Heiberg in the second decade of the 20th century. However, Huffman provides no key to these *sigla*, and so the reader is not told to what they correspond. In the case of the Eutocian passage containing Archytas' duplication of the cube, this may cause some trouble. First, *siglum* **A** does not denote an extant manuscript, but a sub-archetype. Granted, the history of this manuscript can be reconstructed fairly well from its possible first surfacing as a model of a part of Moerbecke's translation all the way to its last resurrection in the middle of the 16th century; but it remains that this *siglum* stands in fact for the consensus (or the majority) of four extant manuscripts copied from **A**.[3] True, Heiberg is straying form standard practice in employing a Latin capital letter as a *siglum* for a (sub)archetype, but he explains his choice in his *praefatio*. In any case, it is regrettable that there is no clarification of this to be found in Huffman's book.

Second, *siglum* **B** is not a Greek manuscript but the Latin translation contained in the ms. *Ottobonianus Latinus* 1850, an autograph of William of Moerbecke. The first place where this feature of the *testimonium* can be surmised is at 343.27; but unfortunately the variant readings here come from a second hand (in fact an owner of the manuscript, the early 16th century scholar Andreas Coner). The reader must wait until 361.22, where the text of Eratosthenes' account is presented, to realize on his own that **B** is in fact written in Latin. As a consequence of all this, a variant reading made by a Greek syntagma followed by the *sigla* **AB**, such as, for example, in the apparatus at 342.12, is misleading unless some explanation is offered. In sum, the attentive reader who does not know the textual history of the Archimedean text will be at a loss in trying to interpret the rather surprising and contradictory indications contained in Huffman's apparatus.

Third, the apparatus of Heiberg's edition has not been reported in its entirety: some variant readings have been skipped without any

[3] These variant readings marked by *siglum* **A** are printed in Heiberg's and accordingly in Huffman's apparatus without accents or breathings. (There are two typos in Huffman's apparatus at 361.22 and 362.27, where a breathing and an accent have been marked.) A scribal note (transcribed in full at Heiberg 1910–1915, 3.x–xi) to an apograph of **A**, namely, *Parisinus graecus* 2360, justifies this in that it ends by asserting that the model was almost completely deprived of prosodical marks.

clear rationale that I can detect. Frankly speaking, these drawbacks make the usefulness of Huffman's apparatus accompanying the Eutocian text rather doubtful. I have not checked the other apparatuses in detail, but the reader should take their indications with some care, excepting those set up by Huffman himself after a personal inspection of the manuscripts.

A fourth problem concerns the ascription to E. S. Stamatis of some emendations to the text. The reference should definitely be to Heiberg, as these emendations are singled out by a *scripsi* in his edition: the name of Stamatis is unduly attached to the photostatic reprint of Heiberg's edition [1972] and for reasons that escape me. In fact, the reader will search in vain even for the *corrigenda* that in the title page of the reprint are said to have been added by Stamatis (the *corrigenda* on 3.vii–viii are by Heiberg). Stamatis did not modify the apparatus—except perhaps by inserting the correction indicated by Heiberg at 1.445 (at least, the Greek fonts employed appear to be different from those regularly used in the rest of the edition)—nor any other feature of the reprinted text. To ascribe to Stamatis even the smallest crumb of Heiberg's magisterial, scholarly work is a slip that could and should have been avoided.

The translation offered of Archytas' solution is correct and well done; but it does include some idiosyncrasies suggesting that Huffman did not rely on well-established conventions in the art of translating Greek mathematical texts. Cases in point are:

- the use of 'to connect' for the standard, and more adequate from the etymological point of view, 'to join',
- a rectangle is said to be 'formed' (instead of the correct 'contained') by two lines, and
- a square is rather oddly said to be 'formed by' (instead of the correct 'described on') a single line.

Moreover, consistency is not always maintained, as, for example, when

- different forms of πίπτειν are translated with forms of 'to fall' or 'to be dropped' (the use of the passive is misleading, since the Greek has an active form);
- a rather crucial particle such as δή is frequently left untranslated [see, e.g., 342.8, 12, 14, and 20], though it should be, since it has a resultative value that makes the deductive chain tighter;

- the only occurrence of οὖν, another resultative particle, is left untranslated;
- ὑποκείμενον ἐπίπεδον is translated by the 'plane that lies under them', i.e., two semicircles (there is in fact no pronoun corresponding to 'them' in the Greek text), rather than as the 'plane laid down', that is, the reference plane;
- κύκλος at 342.3 is translated by 'the circle' rather than 'a circle': it is the first occurrence of that mathematical object in the proof, and therefore it is indefinite; accordingly, the noun does not have the article in the Greek text; and
- the last clause is likewise rendered by 'Therefore of the two given lines [. . . ]' rather than by 'Therefore, of two given lines [. . . ]'. The clause is that kind of 'instantiated general conclusion' by which a geometrical problem typically ends: it is a general statement and hence an indefinite one. An even better version would take the genitive as absolute and translate accordingly, viz., 'Therefore, given two lines. . . '.

The overall plan of the commentary on the geometrical passages is explained in Huffman's assertion that his

> goal is to present an account of the solution which will be intelligible to classicists and historians of philosophy and which can serve as a basis for discussion of the basic mathematical and philosophical issues raised by the proof. [349]

Huffman refers to well-known discussions in the secondary literature for the more technical aspects of the proof, which are completely absent in his own discussion. Yet, I wonder whether such a dismissive attitude towards discussing technical aspects is a mild form of the well-known 'obsession of the intended readership' (a widespread disease affecting the editorial offices of most scholarly publishers), or simply a consequence of the even more widespread belief that mathematical technicalities are irrelevant to the history of ancient thought. At any rate, the lack of any serious analysis of the more technical features of the proof (e.g., its connection with the very advanced domain of the loci on surfaces) greatly diminishes the value of Huffman's presentation. The analysis of the solution is simply a lengthy [351–355] and, at times, quite roundabout[4] restatement of Archytas'

[4] See, e.g., the paragraph at 354–355.

procedure. A short discussion [357–360] follows of the 'elements of geometry' possibly at work in the solution.

Huffman warns the reader that 'most of the language [of the proof] does not go back to Archytas' [349]. But much more care than this is needed in dealing with the Eutocian testimony. In truth, the most likely hypothesis is that the proof has benefited from a robust Eutocian (or pre-Eutocian) rewriting that aimed to put it in accordance with the canonical style of geometrical proofs. This rewriting has very likely affected large-scale syntactical structures in the proof, and not only lexical points.[5] But given this, it is, then, pointless to inquire about what results underlying the proof can ascribed to Archytas in the form we have. A comparison with the Arabo-Latin version preserved in the *Verba filiorum* corroborates this, since the differences between them can well be ascribed to the (double) process of translation. Both this and Eutocius' version come from the same source, but this source should by no means be identified with the Eudemian account. The ancient commentators of the Neoplatonic school consistently worked on epitomes and by epitomes, and we should take this as our main working hypothesis unless contrary evidence is adduced, when dealing with mathematical fragments reported by such commentators as Eutocius. In any event, it is poor policy to dismiss such caution as a 'hypercritical' [346].

In fact, the whole segment of Eutocius' commentary reporting the methods for finding two mean proportionals is likely to have been lifted by Eutocius from some previous collection, be it Sporus' *Keria* as Tannery suggested or not. A comparison with the fairly different mathematical style and language displayed in the passage on Hippocrates' quadrature of lunules reported by Simplicius on Eudemus' authority shows that this must have happened. (Note that Simplicius' institutional career is rather complex, and it is likely that he had access to mathematical sources unavailable to his colleagues in Alexandria: Simplicius appears at times to be proud of presenting hard-to-find texts.) All of this entails taking into account a further, pre-Eutocian rewriting of the solutions to the problem of finding two mean proportionals: it is, for instance, clear that the two proofs

[5] Thus, it comes as no surprise that so many passages can be found in the proof that fit more or less exactly the elementary results or formulaic phrases found in the *Elements*.

ascribed to Menaechmus are entirely rewritten, while the Dioclean solution is modified on crucial points. Eutocius' indication that the Archytan proof is 'as Eudemus reports it' would then simply have been contained in his source.

Huffman asserts that he has

> included references to relevant parts of Euclid's *Elements* to aid in understanding of the proof, but does not intend these references to suggest anything about what elements, if any, Archytas had access to. [351]

Yet he employs the identification of such references as a basis for a rather extended discussion of the starting points assumed by Archytas and of the nature of the 'geometrical elements' accessible to him. However, singling out such references tendentiously skews the ensuing discussion: the implicit reference to 'elements' is not only given prominence by the rewriting that the proof has been subjected to; but is also taken explicitly for granted by Huffman, who loads the solution with an interpretative structure that can be properly assigned only to the author of the text we read, not to Archytas. As a consequence, Huffman is lead to see 'elements' where we are not entitled to see them: we cannot assume that Archytas was 'thinking by elements' when devising and writing down his solution, simply because we have no idea of the way in which Archytas' proof was originally formulated. The only evidence on which the whole discussion rests are Proclus' testimony (itself based obviously on a chain of epitomes) about the existence of pre-Euclidean collections of 'elements' ascribed to Hippocrates, Leon, and Theudius [Friedlein 1873, 66.7–8, 66.20–21 and 67.14–15] and the parallel with allegedly analogous features of Hippocrates' proofs. The latter reduces in fact to a single sentence of Eudemus/Simplicius where it is said that Hippocrates took

> as a starting point and assumed as first among the [results] useful for them [*scil.* the quadratures] that similar segments of circles have the same ratio to one another as their bases in power have (and this he proved by proving that the diameters have the same ratio in power as the circles). [Diels 1882, 61.5–9]

Such an emphasis on starting points in a sentence deriving from a pupil of Aristotle is grounds for scepticism: it is entirely possible that it is simply a product of Eudemus' reading of the Hippocratean achievement, and that nothing should be inferred from it about Hippocrates' starting points, if he assumed any, in his quadratures.

In short, the whole discussion of the 'elements' in Archytas' text is a historiographical artifact whose real motivation appears to lie in the mere fact that there is some secondary literature perceived as authoritative discussing it. The same must be said of the final page of the section dealing specifically with Archytas' proof. This is a discussion of a natural but totally conjectural connection between the discussion about the doubling of the square in Plato's *Meno* and Archytas' solution of the problem of doubling the cube. Of course, Huffman rejects such connection as resting on no evidence, but employing even one single page to discuss such pointless lucubrations is a way to perpetuate them and to give to such minor products of scholarly romance a prominence that they by no means should have. An important scholarly achievement such as this edition of the Archytan remains should have made itself less dependent on other works of secondary literature, even when technical features are at issue.

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