

Alberto A. Martinez: *The Cult of Pythagoras: Math and Myths*

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In this book Martinez considers a number of ‘myths’ (or ‘apparent myths’) that are found in the history of mathematics, and asks the question: “[H]ow does history change when we subtract the many small exaggerations and interpolations that writers have added for over 2000 years?” (p. xvi) He criticizes many writers who, as he argues, have invented history, while he distinguishes invention of historical stories from invention in the growth of mathematics itself, which he commends.

Martinez uses the case of Pythagoras, and the findings of his analysis of different historical texts referring to Pythagoras, as a recurring theme in the book to exemplify his thesis that there is “common mismatch between speculations and evidence in history” (p. xvii) and that, “by being careful with sources, we can replace historical myths with accounts that are better and true” (p. 204). He notes that “Pythagoras was a religious leader who eventually became misinterpreted as a great mathematician and astronomer” (p. 211), and he explains that most mathematical achievements commonly attributed to Pythagoras “are symptoms of our unwillingness to confront uncertainty, to plainly admit: I don’t know what happened” (p. 214). Furthermore he claims that, even if Pythagoras were no longer regarded as a notable mathematical figure of the past, “we should all still study Pythagoras, not to memorize [sic] his alleged achievements but to sharpen our skepticism” so that “[t]he aim would not be to distrust everything Pythagorean but to analyze historical claims against evidence” (p. 204).¹

¹ Unfortunately, Martinez’s account fails to distinguish between the Pythagorean Relation (the geometrical area property) where there is clear evidence that ancient cultures in Mesopotamia, India, and China possessed this knowledge, and the Pythagorean Theorem established by deductive proof. It is considered that the first place where the name “Pythagorean Theorem” appears in English is in Edmund Stone’s (1726) *A New Mathematical Dictionary*.

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The book is structured as follows. The first four chapters deal with the Ancient (Western) Classical World up to the Renaissance, and are mostly about the transmission of myths and the problem of reliability of sources. Chapter 5 mentions Gauss, Galois, and the golden ratio as examples of where writers have romanticized the past in different ways, and from Chapter 6 we have a series of short popular expositions of the arguments involved in the evolution of different mathematical ideas—infinity, imaginary numbers, the complex plane and algebraic numbers, infinitesimals, and non-Euclidean geometry—interspersed with the occasional biographical anecdote. Chapter 11 summarizes and illustrates some important developments in mathematical ideas by considering the roles of imagination, visualization, and mathematical language in these developments, and by referring also to selected philosophical standpoints in mathematics including Platonism, formalism, constructivism, and pluralism. The final chapter is a recapitulation of his main ideas but also the place where Martinez engages in a more explicit discussion of issues of historical evidence and addresses some possible criticisms of how these have been treated.

The list of ‘myths’ and ‘apparent myths’ are presented in the form of questions on pages ix–xi. Many of these questions are certainly intriguing, and their examination in the book makes interesting reading, especially for non-specialists in the history of mathematics. Yet, we wondered what made these questions ‘myths’ and, in particular, what Martinez’s distinction was between ‘myths’ and ‘apparent myths.’ Might ‘apparent myths’ be a way to draw the reader into intriguing, albeit deliberately provocative situations that are set up to be straw men? Related to this is how these terms—‘myth’ and ‘apparent myth’—differ from the term ‘legend’ which appears in several parts of the book and at places seems to be used interchangeably with ‘myth’ as in the Hippias story (p. 27). We believe that more clarity about what is required for a story to be given the status of a ‘myth’ (or an ‘apparent myth’ or a ‘legend’) would help strengthen further the importance of ‘myth-busting,’ a central theme in the book.²

1 The Nature of Historical Evidence

Martinez’s examination of myths brings forward all kinds of considerations about contexts, meanings, communication of ideas, and trustworthiness of sources, all of which relate to the broader issue about the nature of historical evidence and how this supports particular judgments. For example, questions like “Is division the inverse of multiplication?” (p. 87) and “What is understood by the validity of rules?” (pp. 118, 125) are fundamentally about clarifying contexts and meanings. Questions like “Did astronomers omit data to confirm Einstein’s Gravity?” (p. 175) are part of the normal scientific method of challenging claims about evidence and the difficulty of communicating complex scientific ideas. Questions like “Was Pythagoras a mathematician?” (p. 2) or “Did Pythagoras prove the hypotenuse theorem?” are about the trustworthiness of historical sources and the challenges that arise from the fact that many records on which historical judgments are based were created long after the historical era to which they refer.³

² Zhmud (1989, pp. 254–258) provides evidence to show that most of the myths about Pythagoras were established by the fifth century CE.

³ According to Zhmud (2012), “...within the scholarly community no consensus has yet been reached on the most fundamental facts and the separation on the basis of these of soluble problems from fundamentally insoluble” (pp. 1–2).

As Martinez's book is primarily about analyzing historical claims against evidence, and about sharpening skepticism of Pythagoras's alleged achievements, the treatment of evidence can quickly become a point of interest to the reader. Below we have singled out four points that we found particularly interesting.

Our first point is an observation that the book is based on a tacit assumption that Pythagoras actually existed! Specifically, the book offers no evidence, nor does it problematize the claim, that Pythagoras "was born sometime around 570 BCE and [that he] d[ied] roughly seven decades later" (p. 1). Given the number of myths that are examined against historical evidence for the various mathematical achievements commonly attributed to Pythagoras, one could reasonably expect that Pythagoras's very existence would itself be the first of the potential myths examined in the book, but we have nothing from that period, and accounts of his 'life' were written much later. A recent study by Reidweg (2005) provides no hard evidence of his birth, death, family, or who his teachers might have been.

Our second point concerns the process of refuting a historical claim (as in 'myth-busting'). One gets insights into Martinez's position on this issue in different parts of the book. The first example arises in the Introduction beginning with a paragraph where he outlines a few common perceptions (myths?), including that Pythagoras was the first person in history to deduce the spherical shape of earth, and he continues with the sentence: "But none of this is true: there's no evidence for it" (p. xvii).

This sentence appears to suggest that Martinez considers that 'lack of evidence for x ' means that ' x is not true,' and indeed several other parts of the book (especially in the initial chapters) may reinforce this interpretation of his position. Yet the following quotation from the final chapter shows that Martinez's position on refuting historical claims is more complex than one might have originally inferred, though one may wonder why this important issue was not explicitly discussed earlier.

Against my impression [that several claims such as that Pythagoras proved the hypotenuse theorem suffer from a traditional urge to credit Pythagoras, to heap fame upon fame], a common defense is to argue that whereas indeed there is no evidence that someone in fact *did discover* this or that, there is no evidence either that he *did not*, and therefore it is quite possible that he did. Humbug. Possibilities properly do not exist in the past: either events happened, or they did not; our historical conjectures are not "possible," they are merely conceivable, products of the imagination, plausible fictions. They are welcome and useful, but they are scarcely history. (p. 201)

Third, and not unrelated to the previous point, Martinez does offer some useful examples where dominant historical claims may have to be changed in light of new evidence that becomes available as a result of advances in technology and discovery of new sources. Here is one illustrative example:

[F]or centuries many writers had claimed that Greek mathematics did not use the concept of actual infinity. But in 2001, following a new meticulous analysis of the deteriorated and moldy goatskin parchment that was by then more than a thousand years old, paleographers made a striking discovery. A dozen lines of previously undeciphered and faded Greek text, in proposition 14 of Archimedes's "Method," seem to refer to actual infinity. Archimedes assumed that the number of lines inside a rectangle is equal to the number of triangles inside a prism. He wrote about the infinite "equal multitude" of such lines and triangles. (p. 47)⁴

⁴ This passage refers (note 14) to the discovery and translation of the 'Archimedes Palimpsest'. However exciting this might be, there is still much speculation about the decipherment and interpretation of the text, particularly with regard to understanding whether Archimedes used actual 'infinity' in a sense that might have suggested a limiting process. Netz (2003) demonstrates the complexities of this and similar situations.

The fourth and final point is a concern about Martinez's methodological approach to historical research. Specifically, Martinez claimed that, in his pursuit of accurate historical evidence, he translated many primary sources himself:

In my efforts to emphasize the importance of using primary sources, I carried out many of the translations from sources in French, German, and Italian. Latin and Greek are beyond my level of competence, so in many cases I used published translations for ancient languages. Nevertheless, wherever word choices seemed important (as in the ambiguous ancient sources that refer to Pythagoras in relation to mathematics), I did painstakingly translate ancient passages from Latin and Greek. (p. xiv)

After describing help he received from colleagues, he continues:

I then edited his [a colleague's] translations slightly for word choice, in due regard to the original sources. In the end, I can guarantee that our translations are at least more literal than most of the well-known English translations of ancient passages about Pythagoras. At the same time, I apologize if some of our expressions seem coarse: my goal has been fidelity, not smoothness, so we have not engaged in "filling in the blanks," hiding ambiguities, or using later accounts to set the meaning of earlier sources. (pp. xiv-xv)

We were intrigued by the amount of work, and time, that Martinez must have put into checking the primary sources in their different languages, not least because this monumental task requires specialist understanding of context and idiom and expertise in various related fields such as cultural philology and hermeneutics.

2 Concluding Remarks

The book is written in plain English, with bibliographical materials and other technical information discussed in notes which are organized by chapter at the end of the book. These notes vary considerably in their quality. While some can be omitted by the ordinary reader, some attention to the notes is required for better understanding of Martinez's arguments, and they are certainly useful to the specialist. The lack of a proper bibliography makes it difficult for direct reference and while there is a useful index of names there are very few subject references. Furthermore, a certain level of mathematical background is required for full appreciation of some of Martinez's accounts.

In conclusion, the ordinary reader should find interesting Martinez's account of how certain popular claims about individuals and events in the history of mathematics may actually be 'myths' and of what may be involved in refuting, accepting, or revising such claims. In this context, Martinez makes the case for raising issues in both the history and the philosophy of mathematics as pertinent knowledge for teachers. We believe that mathematics teachers and lecturers and graduate students in mathematics education would benefit from reading the book, as that would help them become more aware of the issues, uncertainties, and challenges surrounding knowledge about the history of mathematics, which at the outset may appear unproblematic to some. Increased awareness can then lead to reflection on, and possible re-thinking of, pedagogical practices related to the role of history in mathematics teaching and learning.

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