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(b. Elis, Greece; fl. 400 b.c.)

*philosophy, mathematics.*

Elis was a small state in the northwest of the Peloponnesus whose inhabitants had charge of the Olympic festival. Hippias' father was named Diopithes,<sup>1</sup> but his ancestry is otherwise unknowns.<sup>2</sup> In the Platonic dialogue *Hippias Major*<sup>3</sup> he is made to say that he was young when Protagoras was old, and in the *Protagoras* Plato represents him as present at a philosophic discussion with that eminent Sophist about 432 b.c.<sup>4</sup> The date of the birth of Protagoras is uncertain but is usually placed from 488 to 485. In Plato's *Apology*<sup>5</sup> set in 399, Hippias is mentioned as a teacher of youth along with Gorgias and other famous Sophists, and may then be presumed to have been at the height of his fame. He was therefore a contemporary of Plato. His wife Platane bore him three sons; and when she was left a widow, the orator Isocrates in extreme old age took her in marriage and adopted her youngest son, Aphareus,<sup>6</sup> who achieved some fame as a tragic poet. Isocrates died in 338. These facts would suggest that Hippias had a long life; and the belief is made certain if, with Mario Untersteiner, the preface to the *Characters* of Theophrastus is attributed to Hippias, for he is there made to say that he has reached ninety-nine years of age.<sup>7</sup> The old notion that he was killed while weaving plots against his native land must be abandoned now that the correct name in the text of Tertullian has been established as Ichthyas.<sup>8</sup>

Hippias was taught by an otherwise unknown Aegesidamus, and he emerged as a polymath who wrote and lectured over a wide range of disciplines: rhetoric, politics, poetry, music, painting, sculpture, and astronomy, as well as the philosophy and mathematics on which his fame chiefly rests.<sup>9</sup> The secret of his wide knowledge appears to have been an exceptional memory. According to Philostratus, he had a system of mnemonics such that if he once heard a string of fifty names, he could repeat them in correct order.<sup>10</sup> Most of what is known about Hippias' life and character comes from a dialogue between Socrates and Hippias recorded by Xenophon<sup>11</sup> and from the two Platonic dialogues that bear his name, the *Hippias Major* and *Hippias Minor*. Their authenticity has been disputed, but even if not genuine they still correctly reflect Plato's attitude; in these dialogues Hippias is represented as a naive and humorless boaster who cannot stand up to the remorseless logic of Socrates. Xenophon's portrait is not so ruthless, but there also Hippias is reduced to silence by Socrates' arguments. Hippias was a second-generation Sophist, and Plato had no love for the Sophists as a class. Apart from more fundamental differences, Plato's aristocratic soul was offended by their professional teaching; and Hippias was especially successful in negotiating lecture fees, particularly in Sicily. Although he received none in Sparta, where the law forbade a foreign education.<sup>12</sup>

The picture in the Platonic dialogues is no doubt a caricature; but in the light of Plato's more sympathetic treatment of other individual Sophists, there must have been enough truth in the caricature for it to be recognizable as a portrait.<sup>13</sup> Hippias is made to accept flattery even when laid on with a trowel, acknowledging that he had never found any man to be his superior in anything.<sup>14</sup> At the Olympic festival it was his custom to offer to discourse on any subject proposed to him out of those which he had prepared and to answer any questions.<sup>15</sup> He once appeared at the festival with everything that he wore made by himself, not merely his clothes but also a ring, an oil flask, and an oil scaper—which bears out the statement in the *Suda Lexicon* that he made self-sufficiency the end of life—and he brought with him poems, epics, tragedies, dithyrambs, and all kinds of prose works.<sup>16</sup>

Hippias could not have been such a figure of fun as the Platonic dialogues make him out to be, for he was frequently asked to represent his native state on missions to other states, notably Sparta.<sup>17</sup> He was widely traveled—two visits to Athens are recorded—and in Sicily his influence was lasting if, as Untersteiner believes, he was the mentor of [Dionysius the Younger](#) and inspired the work known as the *Dissoi logoi*.<sup>18</sup>

The *Suda Lexicon* tersely records that Hippias "wrote many things." None of his voluminous works has survived, but some of the titles and hints of the contents are known. His *Synagoge*, known through Athenaeus, has usually been thought, on the strength of a passage in [Clement of Alexandria](#) which seems to refer to it, to have been merely a miscellany in which he put together sayings of poets and prose writers, both Greek and foreign.<sup>19</sup> But Bruno Snell has advanced the theory that through this work Aristotle derived his knowledge of Thales; that the views of Thales about the All being water and about the souls of inanimate objects are thereby shown to be derived from earlier mythological speculations; and that the *Synagoge* is to be looked upon as the earliest work in both the history of Greek philosophy and the history of Greek literature.<sup>20</sup> If this is so, it encourages the thought that Hippias' *Nomenclature of Tribes*<sup>21</sup> may not have been a mere catalog but an expression of his belief in the fundamental unity of all mankind. His *Register of Olympic Victors* was no doubt a piece of Elian patriotism. It was

the first such list to be drawn up; and Plutarch notes that, since it came so late after the events recorded, too much authority should not be attached to it.<sup>22</sup> Among his epideictic or set speeches, the one known as *The Trojan* may have been in dialogue form; in it Nestor suggests to Neoptolemus many lawful and beautiful pursuits by which he might win fame.<sup>23</sup> Hippias wrote an elegiac inscription for the statues made by Calon at Olympia in memory of a boys' choir from Messina drowned in crossing to Rhegium.<sup>24</sup> More important in its ultimate significance than any of these compositions is a work on the properties of the geometrical curve he discovered, since known as the quadratrix.

Hippias' teaching has to be reconstructed from the scattered references to him in Greek and Latin authors. Untersteiner has argued that Hippias was the author not only of the preface to Theophrastus' *Characters* but also of a spurious chapter in Thucydides (III, 84) dealing with events in Corcyra and of the epideictic speech known as the *Anonymus Iamblichii*; that the *Dissoi logoi*, a work drawing on Pythagorean and Sophistic sources, reflects the teaching of Hippias; and that the philosophical digression in Plato's seventh letter is an attack upon Hippias' doctrines.<sup>25</sup> If this were established, it would enable a clearer picture of Hippias' philosophy to be drawn; but Untersteiner's theories are too conjectural for any conclusions to be based on them. It is therefore to the dialogues between Socrates and Hippias as recorded by Xenophon and Plato, and to a passage in Plato's *Protagoras* which may well be an imitation of the Sophist's style, that we must look in the main for Hippias' teaching.<sup>26</sup>

The core of it would appear to be a distinction between *νόμος* and *φύσις*,<sup>27</sup> that is, between positive law and nature, with a corresponding belief in the existence of unwritten natural laws which are the same for all men in all places and at all times. Reverence for the gods and honor for parents are among such natural laws.<sup>28</sup> It was one of Hippias' fundamental beliefs that like is kin to like by nature, and he extended it to mean that men are neighbors and kinsmen. Positive law is a matter of human agreement and can be altered; it can be a great tyrant doing violence to human nature. It is a pity that Hippias' teaching has to be seen through the distorting mirrors of Plato and Xenophon, for he would appear to have been a progenitor of the doctrine of [natural law](#), of the social-contract theory of the state, and of the essential unity of all mankind—in fact, no mean thinker.

It is clear from Plato's raillery that Hippias claimed proficiency in arithmetic, geometry and astronomy,<sup>29</sup> and one important discovery is attributed to him: the transcendental curve known as the quadratrix.

The evidence comes from two passages in Proclus which are probably derived from Geminus. The first is "Nicomedes trisected every rectilinear angle by means of the conchoidal curves... Others have done the same thing by means of the quadratrices of Hippias and Nicomedes, making use of the mixed curves which are called quadratrices."<sup>30</sup> The second is "In the same manner other mathematicians are accustomed to treat of curves, setting forth the characteristic property of each type. Thus Apollonius shows what is the characteristic for each of the conic sections, Nicomedes for the conchoids, Hippias for the quadratrices, and Perseus for the spiric curves."<sup>31</sup>

Who is this Hippias? The natural assumption is that he is Hippias of Elis, who is mentioned in an earlier passage by Proclus,<sup>32</sup> this time in the summary of geometry derived from Eudemus, as having recorded that Mamercus (or perhaps Ameristus), brother of the poet Stesichorus, acquired a reputation for geometry. No other Hippias is mentioned by Proclus; and it is in accordance with his practice, have once referred to a person in full, to omit the patronymic on subsequent mention.<sup>33</sup> Hippias of Elis, as shown by the references of Plato and Xenophon, had mathematical qualifications; and among the many bearers of the name Hippias in antiquity there is no other of whom this can be said.<sup>34</sup> It is therefore natural to identify the Hippias who is mentioned in connection with quadratrices as Hippias of Elis; and most historians of Greek mathematics, from J. E. Montucla to B. L. van der Waerden, have done so.<sup>35</sup>

The objections made can easily be discounted.

1. If he made so important a discovery as the quadratrix, it has been argued, Hippias would be recorded in Proclus' "Eudemian Summary"; but the omission is accounted for by the Platonic prejudice against the Sophists, and the omission of Democritus is even more remarkable.

2. [Diogenes Laertius](#) says that Archytas was the first to use an instrument for the description of a curve,<sup>36</sup> and the quadratrix requires an instrument for its description. Yet, on the one hand, an indefinite number of points on the quadratrix can be obtained by the ruler and compass and, on the other hand, Diogenes is not a trustworthy guide in this matter, since (a) there is no suggestion of an instrument in Eutocius' description of the curve found by Archytas to solve the problem of doubling the cube;<sup>37</sup> and (b) Eratosthenes specifically states that Archytas was not able to realize his solution mechanically.<sup>38</sup>

3. Hippias is not mentioned by Pappus and Iamblichus in their accounts of curves used for squaring the circle;<sup>39</sup> but this is explained if, as seems probable, Hippias did not use the curve for that purpose but only for trisecting an angle.

It may therefore be taken that the Hippias who is mentioned by Proclus in connection with the quadratrix is Hippias of Elis; and, if so, he was its discover, since he preceded Nicomedes. But did he use it for squaring the circle? And did he give it the name quadratrix? This is more doubtful. Proclus implies that the curve was used by Hippias for trisecting an angle, saying nothing about squaring the circle; and those Greek authors who write about the squaring of the circle do not mention Hippias. A fundamental and obvious property of the curve is that it can be used to divide an angle in any given ratio, and therefore to

trisect it; but to use it for squaring the circle is a more sophisticated matter and might not be obvious to the original discoverer. This can be seen from the way the curve is generated, as described by Pappus.<sup>40</sup>

Let  $ABCD$  be a square and  $BED$  a quadrant of a circle with center  $A$ . If the radius of the circle moves uniformly from  $AB$  to  $AD$  and in the same time the line  $BC$  moves parallel to its original position from  $BC$  to  $Ac$ , then at any given time the intersection

of the moving radius and the moving straight line will determine a point  $F$ . The path traced by  $F$  is the curve. If it is desired to trisect the angle  $EAD$ , let  $H$  be taken on the perpendicular  $FK$  to  $Ad$  such that  $FK = 3 HK$ . Let a straight line be drawn through  $H$  parallel to  $AD$ , and let it meet the curve at  $P$ . Let  $AP$  be produced to meet the circle at  $Q$ . Then, by the definition of the curve,

and therefore  $\angle QAD$  is one-third of  $\angle EAD$ . It is obvious that the curve can be used not merely to trisect an angle but also to divide an angle in any given ratio; trisection is specified because this was one of the great problems of Greek mathematics when Hippias flourished.

If  $a$  is the length of a side of the square,  $\rho$  is any radius vector  $AF$ , and  $\phi$  is the angle  $EAD$ , the equation of the curve is

or

The use of the quadratrix to square the circle is a more complicated matter, requiring the position of  $G$  to be known and an indirect proof *per impossibile*. (For this the article on Dinostratus may be consulted.)

The ancient witnesses can therefore be reconciled if Hippias discovered the curve and used it to trisect an angle, but its utility for squaring the circle was perceived only by such later geometers as Dinostratus and Nicomedes. In that case Hippias could not have called his curve the quadratrix, and we do not know what name he gave it. It is no objection that Proclus refers to “the quadratrices of Hippias and Nicomedes,” for we have no hesitation in saying that Menaechmus discovered the parabola and hyperbola, although these terms did not come into use until Apollonius; Menaechmus would have called them “section of a right-angled cone” and “section of an obtuse-angled cone.” There is, however, a more serious objection. From the second of the Proclus passages quoted above it could, without straining the sense, be inferred that Hippias wrote a whole treatise on the curve, setting forth its special properties; and in that case the probability increases that he was aware of its use for squaring the circle. Paul Tannery was of this opinion, and T. L. Heath thinks it “not impossible”; but no balance it seems preferable to hold, with C. A. Bretschneider and Moritz Cantor, that the circle-squaring property was discovered, and the name quadratrix given, later than Hippias.<sup>41</sup>

The citation of Hippias as the authority for Mamercus’ mathematical proficiency has led some to suppose that Hippias wrote a history of geometry.<sup>42</sup> If so, it would be the first, antedating Eudemus by perhaps three-quarters of a century. But this is to read too much into the Greek word *ιστόρησεν*, translated above as “related.” It does not necessarily imply a full-scale treatise, but only that Hippias mentioned the fact in one of his many works.

## NOTES

1. *Suda Lexicon*, “*Ἰππίας*,” Adler ed., pt. 2 (Leipzig, 1937), Iota 543, p. 659.

2. Apuleius, *Florida* 9, Helm ed., p. 12.1.

3. Plato, *Hippias Major*, 282 d-e.

4. Plato, *Protagoras*, 337c6–338b1. The scene is usually assigned to 432 b.c. but—as Ahteanus, V.218c-d. gulick ed. (Loeb), II (London-New York, 1928), 428, points out—in antiquity Hippias could not have safely stayed in Athens until an annual truce was concluded in the archonship of Isarchus (423), and the chronology of what is presumably a fictitious gathering cannot be pressed.

5. Plato, *Apology*, 19e1–4.

6. [Plutarch], *Lives of the Ten Orators*, 838a-839c, Fowler ed. (Loeb); and *Moralia* 10, pp. 376–385 (the author makes Platane the daughter and not the widow of Hippias); Harpocration, *Lexicon*, “*Ἀφαγεύς*,” Dindorf ed., I (Oxford, 1853), 68.18; Zosimus, *Historia nova* V, Mendelssohn ed. (Leipzig, 1887). Isocrates’ marriage followed his liaison—when already an old man—with the courtesan Lagisca; hence “in extreme old age.”

7. Theophrastus, *Characters*, pref. 2, Diels ed. (Oxford, 1909). See Mario Untersteiner, “Il proemio dei ‘Caratteri’ di Teofrasto e un probabile frammento di Ippia,” in *Rivista di filologia classica*, n.s. 26 (1948), 1–25. In *I sofisti*, 2nd ed., fasc. 2, p. 115, translated by Kathleen Freeman in *The Sophists*, p. 274, he says the preface is “definitely a work of Hippias.” But it is incredible that the author should have been still writing—even banalities—at the age of ninety-nine; and the figure must be

treated with reserve. Perhaps there is a textual error. The preface is certainly not the work of Theophrastus; but the only reason for attributing it to Hippias is that it is such a work as the boastful Hippias of Plato's dialogues might have written, which is not a sufficiently strong ground.

8. The printed texts of Tertullian, *Apologeticum*, 46.16, until 1937 read: “et Hippias, dum civitati insidias dispoint, occiditur.” There was some dispute whether this referred to Hippias, son of Pisistratus; but since Tertullian is cataloging the misdeeds of pagan philosophers, there can be little doubt that the reading, if correct, would refer to Hippias of Elis. But H. Emonds, “Die Oligarchenrevolte zu Megara im Jahre 375 und der Philosoph Ichthyas bei Tertullian *Apol.* 46.16,” in *Rheinisches Museum für Philologie*, n.s. **86** (1937), 180–191, shows that the reading “et Hippias” has no MS authority and that “Ichthyas” (Ichthyas of Megara) should be substituted. Emonds has been followed by H. Hoppe (Vienna, 1939) and E. Dekkers (Tournai, 1954) in their subsequent eds.

If the reading “Hippias” had been correct, the event could be referred, as in Untersteiner, to the war waged in 343 by the democrats of Elis, among whom Hippias might be numbered, in alliance with the surviving soldiers of the Phocian adventurer Phalaeus. With this peg gone, the case for giving Hippias an exceptionally long life is weakened, particularly if Platane is regarded as daughter and not wife of Hippias (see note 6) and the evidence for ascribing the Theophrastian preface to Hippias is regarded as unconvincing.

9. *Suda Lexicon*, “Ἰππίας,” Otto Apelt, *Beiträge zur Geschichte der griechischen Philosophie*, pp. 382–384, 391–392, gives no convincing reasons for thinking that Aegesidamus is a mistake for Hippodamus of Miletus.

Xenophon, *Memorabilia* IV.6, has Socrates apply the word “polymath” to Hippias; and Plato, *Hippias Minor*, 368b, makes Socrates call him, no doubt sarcastically, “the wisest of men in the greatest number of arts.”

10. Philostratus, *Lives of the Sophists* 1.11, Kayser ed., II (Leipzig, 1871), 13.27–30. See also Xenophon, *Symposium* 4.62; Plato, *Hippias Major*, 285E. According to Cicero, *De oratore* 2.86–351–354, the first to work out a mnemonic was Simonides, who is mentioned along with Hippias by Aelian, *On the Characteristics of Animals* VI.10, Scholfield ed. (Loeb), II (London-Cambridge, Mass., 1959), 22.9–13. [Ammianus Marcellinus](#) XVI.5.8, Clark ed., I (Berlin, 1910), 76.17–20, notes the belief of some writers that his feats of memory, like those of King Cyrus and Simonides, were due to the use of drugs.

11. Xenophon, *Memorabilia* IV.4. 19–20.

12. *Hippias Major*, 282d–e, 283b–284c. In the former passage Hippias boasts that although Protagoras was in Sicily at the time, he made more than 150 minas—at one small place, Inycus, taking in more than 20 minas.

13. See W. K. C. Guthrie, *A History of Greek Philosophy*, III (Cambridge, 1969), 280.

14. Plato, *Hippias Minor* 364a; compare *Hippias Major* 281d.

15. Plato, *Hippias Minor* 363c.

16. *Ibid.*, 368b–c; Apuleius, *Florida* 9, Helm ed., pp. 12.3–13.6.

17. Plato, *Hippias Major* 281a–b; Xenophon, *Memorabilia* IV.4.5.

18. The visits are recorded in Plato, *Hippias Major* 281a; and Xenophon, *Memorabilia* IV.4.5. See Mario Untersteiner, “Polemica contra Ippia nella settima epistola di Platone,” in *Rivista di storia della filosofia*, **3** (1948), 101–119. The text of the *Dissoi logis* is given in Diels-Kranz, *Vorsokratiker*, II, 90, pp. 405–416, and by Untersteiner, *Sofisti*, fasc. 3, pp. 148–191.

19. Athenaeus, XIII, 608f–609a, Gulick ed. (Loeb), VI (London-Cambridge, Mass., 1937), 280; [Clement of Alexandria](#), *Stromata* VI.c.2, 15.2, Stählin ed., *Clemens Alexandrinus* (in the series *Die Griechischen Christlichen Schriftsteller*), 3rd ed., II (Berlin, 1960), 434.23–435.5. Clement is making the point that the Greeks were incorrigible plagiarists, as shown by Hippias.

20. Bruno Snell, in *Philologus*, **96** (1944), 170–182. G. B. Kerferd, in *Proceedings of the Classical Association*, **60** (1963), 35–36, has adopted and extended Snell's views, and in particular has attributed to Hippias the doctrine of “continuous bodies” mentioned in *Hippias Major* 301b–e. (This passage would seem to have anticipations of Smuts's “holism”—τά ὅλα τῶν πραγμάτων.)

21. Scholium to Apollonius of Rhodes, III.1179, *Scholia in Apollonium Rhodium vetera*, Wendel ed. (Berlin, 1935), p. 251.13–14.

22. Plutarch, *Numa* 1.6, Ziegler ed., *Vitae parallelae*, III, pt. 2 (Leipzig, 1926), 55.7–9.

23. Plato, *Hippias Major* 286a.

24. Pausanias, V.25.4, Spiro ed. (Teubner), II (Leipzig, 1903), 78.4–13. Another statue made by Calon is dated 420–410 b.c.; but this does not have much bearing on Hippias' date, since his verses were added some time after the statues were made, in place of the original inscription.

25. See final paragraph of Bibliography. The *Anonymus Iamblichi* is reproduced in *Diels-Kranz, Vorsokratiker*, II, 89, 400–404.

26. Xenophon, *Memorabilia* IV. 4.5–23. This passage purports to record a discussion between Socrates and Hippias in which Socrates identifies the just with the lawful—a view difficult to reconcile with Plato's Socrates—and discomfits Hippias.

In *Protagoras* 337c–338b, Hippias mediates between Socrates and Protagoras, urging Socrates not to insist on brief questions and answers, and Protagoras not to sail off into an ocean of words. This pleases the company. In the opening sentence Plato would appear to have packed the main tenets of Hippias' thought: "Gentlemen, I look upon you all as kinsmen and neighbors and fellow citizens by nature, not by law; for by nature like is akin to like, but law, tyrant of men, often constrains us against nature."

27. Regarding these as key words, and in the fourth and fifth centuries as catch words, W. K. C. Guthrie devotes a chapter to the antithesis in *A History of Greek philosophy*, III, 55–134.

28. Xenophon, *Memorabilia* IV.4.19–20.

29. Plato, *Protagoras* 318e; *Hippias Major* 366c–368a. The former passage deserves citation because it implies that Hippias believed in compulsory education in the quadrivium at the secondary level. Protagoras is the speaker: "The other [Sophists] mistreat the young, for when they have escaped from the arts they bring them back against their will and plunge them once more into the arts, teaching them arithmetic, astronomy, geometry and music—and here he looked at Hippias—whereas if he comes to me he will not be obliged to learn anything except what he has come for."

30. Proclus, *In primum Euclidis*, Friedlein ed. (Leipzig, 1873; repr., 1967), 272.3–10.

31. *Ibid.*, p. 356.6–12

32. *Ibid.*, p.65.11–15. The objection by W. K. C. Guthrie, *op.cit.*, III. 284, that it is "nearly 200 Teubner pages" earlier is not convincing.

33. He so treats Leodamas of Thasos, Oenopides of Chios, and Zeno of Sidon; and if he departs from this practice in the case of Hippocrates of Chios, it is only to avoid confusion with Hippocrates of Cos.

34. The Hippias described by the pseudo-Lucian in *Hippias seu Balneum* as a skillful mechanic and geometer is a fictional character.

35. J. E. Montucla, *Histoire des mathématiques*, I, 181; B. L. van der Waerden, *Science Awakening*, 2nd ed. (Groningen, n.d.), p. 146. Also C. A. Bretschneider, *Die Geometrie und die Geometer vor Euklides*, pp. 194–196; but H. Hankel, *Zur Geschichte der Mathematik*, p. 151, note, thought him "sicherlich nicht der Sophist Hippias aus Elis." After initial disbelief in the identification, G. J. Allman, *Greek Geometry From Thales to Euclid*, pp. 92–94, 189–193, was converted by Paul Tannery, in *Bulletin des sciences mathématiques et astronomiques*, 2nd ser., 7 (1883), 278–284; and by Moritz Cantor, *Vorlesungen über Geschichte der Mathematik*, 3rd ed., 1, 193–197. After a thorough examination. A. A. Björnbo, in Pauly-Wissowa, VIII, cols. 1706–1711, accepted the identification; but Gino Loria, *Le scienze esatte nell' antica Grecia*, 2nd ed., p. 69, would say only: "Pesando dunque gli argomenti pro e contro l'identificazione, sembra a noi che i primi vincono per valore i secondi." T. L. Heath *A History of Greek Mathematics*, 1, 2, 23, 225, takes the identification for granted; but U. von Wilamowitz, *Platon*, I, 136, note, thinks that the name is so common that it is a matter of discretion; and W. K. C. Guthrie, *loc.cit.*, is undecided.

36. [Diogenes Laertius](#) VIII.iv, Cobet ed., p. 224.

37. Archimedes, Heiberg ed., 2nd ed., III, 84.12–88.2.

38. *Ibid.*, p. 90.4–11.

39. Pappus, *Collection*, Hultsch ed., pp. 250.33–252.3: "For the quadrature of the circle a certain curve was assumed by Dinostratus and Nicomedes and certain others more recent, and it takes its name from its property, for it is called by them quadratrix."

Iamblichus as recorded by Simplicius, *In Aristotelis Categorias*, Kalbfleisch ed., p. 192.19–24: "Archimedes succeeded by means of the spiral-shaped curve, Nicomedes by means of the curve known by the special name quadratrix, Apollonius by means of a certain curve which he himself terms 'sister of the cochloid' but which is the same as the curve of Nicomedes, and

lastly Carpus by means of a certain curve which he simply calls 'the curve arising from a double motion.' "When W. K. C. Guthrie, *op. cit.*, III, 284, note 2, finds significance in "the silence of Simplicius, who at *Physics* 54 ff (Didls ed.) seems to be giving as complete an account as he can of attempts to square the circle, "it must be objected that Simplicius' aim in that passage was much more limited: the efforts of Alexander and Hippocrates.

40. Pappus, *op. cit.*, p. 252.5–25.

41. For references see Bibliography.

42. Kerfered, *op. cit.*, appears to hold this view.

## BIBLIOGRAPHY

I. Original Works. None of Hippias' many works has survived. The titles of the following are known: 'Ἐθνωὶδὸννομαῖαι, *Nomenclature of Tribes*; 'Ὀλυμπιανγραῶν, *Register of Olympic Victors*; Συναγωγή, *Collection*; and Τρωικός (*sc.* λόγος or διάλογος), *The Trojan*. Hippias is also known to have composed an elegiac inscription for the statues at Olympia in memory of a boys' choir from Messina drowned in crossing to Rhegium. He probably wrote a treatise on the quadratrix, of which he was the discoverer.

References to these works, and other witnesses to Hippias, are collected in H. Diels and W. Kranz, *Die Fragmente der Vorsokratiker*, 6th ed., II (Dublin-Zurich, 1970), 86, 326–334; and Mario Untersteiner, *Sofisti: Testimonianze e frammenti*, vol. VI in *Biblioteca di Studi Superiori*, fasc. 3 (Florence, 1954), 38–109.

It is conjectured by Untersteiner that Hippias was also the author of the preface to the *Characters* of Theophrastus; the *Anonymus Iamblichii*; and a spurious chapter in the third book of Thucydides' history, III, 84.

II. Secondary Literature. In Greek literature the main secondary sources for Hippias are Plato, *Protagoras* 315C, 337C–338B; Plato (?), *Hippias Major* and *Hippias Minor*, Burnet ed., III (Oxford, 1903; repr., 1968); and Xenophon, *Memorabilia* IV.4.5–25, Marchant ed. (as *Commentarii*), in vol. II of Xenophon's *Works* (Oxford, 1901; 2nd ed., 1921). Other scattered references will be found in the notes.

The best recent accounts of Hippias as a philosopher are W. K. C. Guthrie, *A History of Greek Philosophy*, III (Cambridge, 1969), 280–285; and Mario Untersteiner, *I sofisti* (Milan, 1948; 2nd ed., 1967), II, 109–158, translated by Kathleen Freeman, *The Sophists* (Oxford, 1954), pp. 272–303.

Hippias' mathematical work may be studied in G. J. Allman, *Greek Geometry From Thales to Euclid* (Dublin, 1889), pp. 92–94, 189–193; A. A. Björnbo, "Hippias 13," in Paulty-Wissowa, *Real-Encyclopädi*, VIII (Stuttgart, 1913), cols. 1706–1711; C. A. Bretschneider, *Die Geometrie und die Geometer vor Euklides* (Leipzig, 1870), pp. 94–97; Moritz Cantor, *Vorlesungen über Geschichte der Mathematik*, 3rd ed., I (Leipzig, 1907), 193–197; James Gow, *A Short History of Greek Mathematics* (Cambridge, 1884), pp. 162–164; T. L. Heath, *A History of Greek Mathematics*, I (Oxford, 1921), 225–230; Gino Loria, *Le scienze esatte nell' antica Grecia*, 2nd ed. (Milan, 1914), pp. 67–72; and Paul Tannery, "Pour l'histoire des lignes et surfaces courbes dans l'antiquité," in *Bulletin des sciences mathématiques et astronomiques*, 2nd ser., 7 (1883), 278–291, repr. in his *Mémoires scientifiques*, II (Toulouse-Paris, 1912), 1–18.

Among other noteworthy assessments of Hippias are the following, listed chronologically: J. Mahly, "Der Sophist Hippias von Elis," in *Rheinisches Museum für Philologie*, 15 (1860), 514–535, and 16 (1861), 38–49; O. Apelt, *Beiträge zur Geschichte der griechischen Philosophie*, VIII, "Der Sophist Hippias von Elis" (Leipzig, 1891), 367–393; W. Zilles, "Hippias aus Elis," in *Hermes*, 53 (1918), 45–56; D. Viale (Adolfo Levi), "Ippia di Elide e la corrente naturalistica della sofistica," in *Sophia* (1942), pp. 441–450; Bruno Snell, "Die Nachrichten über die Lehren des Thales und die Anfänge der griechischen Philosophie- und Literaturgeschichte," in *Philologus*, 96 (1944), 170–182; and G. B. Kerferd, in *Proceedings of the Classical Association*, 60 (1963), 35–36.

Mario Untersteiner has put forward his conjectures about Hippias in "Un nuovo frammento dell' Anonymus Iamblichii. Identificazione dell' Anonimo con Ippia," in *Rendiconti dell' Istituto lombardo di scienze e lettere*, classe di lettere, 77, fasc. II (1943–1944), 17; "Polemica contro Ippia nella settima epistola di Platone," in *Rivista di storia della filosofia*, 3 (1948), 101–119; and "il proemio dei 'Caratteri' di Teofrasto e un probabile frammento di Ippia," in *Rivista di filologia classica*, n.s. 26 (1948), 1–25.

Ivor Bulmer-Thomas