Dating the Earliest Coins of Athens, Corinth and Aegina*

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Abstract

An article recently published in this journal (D. Kagan, *AJA* 86 [1982] 343–60) proposes to revive a seventh century B.C. dating for the earliest coinages of Aegina, Corinth and Athens, in keeping with the ancient testimonia that connect coinage with Pheidon of Argos and the reforms of Solon. Apart from such testimonia, however, the only chronological argument adduced for this dating is Kagan's contention that coinage began in Lydia and Ionia near the beginning of the seventh century.

Here we review the very considerable body of literary, typological, contextual, metallurgical, stylistic and comparative numismatic evidence that bears on the chronology of archaic Aeginetan, Corinthian and Athenian coinage, and conclude that, regardless of when in the seventh century coinage developed in western Asia Minor, it was not introduced at Aegina, Corinth and Athens until the sixth century B.C.

Some 20 years ago, D. Kagan defended the ancient historical tradition that the coinage of Aegina was instituted by Pheidon, the relatively obscure tyrant of Argos whose career is most commonly placed in the first half of the seventh century B.C.[1] Now Kagan has broadened his defense in a paper that argues that the early electrum coins from the Central Basis deposit in the Artemisium at Ephesus were buried around the middle of the seventh century, that the invention of coinage in western Asia Minor consequently goes back to around 700, and that all chronological difficulties are therefore removed for accepting the view, widely held by numismatists and historians until the 1950s, that coinage spread to Aegina before ca. 650 B.C. and thence to Corinth and Athens later in the seventh century.[2]

It would be premature at this time to arbitrate between Kagan's discussion of the Artemisium Central Basis deposit and the opposing position advocated by E.S.G. Robinson and most recently by M.J. Price that the deposit was not closed until around or after 600.[3] On March 23–24, 1984, a colloquium was held at the British Museum for the explicit purpose of reviewing the finds and related architectural, historical-literary, and numismatic evidence for the absolute chronology of the earliest stages of the Artemisium. The papers presented at the colloquium are being published together, and when they appear all future

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Special abbreviations used are:

ACGC	C.M. Kraay, *Archaic and Classical Greek Coins* (Berkeley and Los Angeles 1976).
Cahn 1946	H.A. Cahn, "Zur frühattischen Münzprägung," *MusHelv* 3 (1946) 133–46; reprinted in Cahn, *Kleine Schriften zur Münzkunde und Archäologie* (Basel 1975) 70–80.
Cahn 1971	H.A. Cahn, "Dating the Early Coinages of Athens," lecture given at the American Numismatic Society, April 17, 1971; *Kleine Schriften* 81–97.
Cahn 1977	H.A. Cahn, "Asiut, kritische Bemerkungen zu einer Schatzfundpublikation," *SNR* 56 (1977) 279–87.
*HN*²	B.V. Head, *Historia Numorum*² (Oxford 1911).
Holloway	R.R. Holloway, "An Archaic Hoard from Crete and the Early Aeginetan Coinage," *ANSMN* 17 (1971) 1–21, pls. 1–8.
IGCH	M. Thompson, O. Mørkholm and Colin M. Kraay, *An Inventory of Greek Coin Hoards* (New York 1973).
Kagan 1960	D. Kagan, "Pheidon's Aeginetan Coinage," *TAPA* 91 (1960) 121–36.
Kagan 1982	D. Kagan, "The Dates of the Earliest Coins," *AJA* 86 (1982) 343–60.
Kroll	J.H. Kroll, "From Wappenmünzen to Gorgoneia to Owls," *ANSMN* 26 (1981) 1–32, pls. 1–2.
"Owls"	C.M. Kraay, "The Archaic Owls of Athens: Classification and Chronology," *NC* ser. 6.16 (1956) 46–68, pl. 13.
Price and Waggoner	M. Price and N. Waggoner, *Archaic Greek Coinage, The Asyut Hoard* (London 1975).
Seltman	C.T. Seltman, *Athens, Its History and Coinage before the Persian Invasion* (Cambridge 1924).

[1] Kagan 1960. The chronology of Pheidon is notoriously problematic (Kagan 1960:125–28; A.R. Burn, *CR* 33 [1983] 252); but Kagan (1982:344, 359) has recently shown a preference for the first half of the seventh century, the dating preferred by most historians and numismatists and hence provisionally accepted here.

[2] Kagan 1982.

[3] E.S.G. Robinson, "The Coins from the Ephesian Artemision Reconsidered," *JHS* 71 (1951) 156–67; "The Dates of the Earliest Coins," *NC* ser. 6.16 (1956) 1–8; and M.J. Price, "Thoughts on the Beginnings of Coinage," in C.N.L. Brooke, I. Stewart, J.G. Pollard and T.R. Volk eds., *Studies in Numismatic Method Presented to Philip Grierson* (Cambridge 1983) 1–4.

discussions of this complex problem will rest on a much better informed and up-to-date footing.

In the meanwhile, we believe that it is necessary to address the contentions with which Kagan concludes, namely, that, given an early seventh century date for the earliest electrum coinage of Lydia and Ionia, the literary testimonia regarding a Pheidonian coinage at Aegina and a Solonian reform of coinage at Athens can and should be admitted as reliable evidence for dating the earliest coinages of these states and of Corinth before 600. In contesting this conclusion, we make very little claim to originality. Most of the evidence and arguments that we cite for a sixth century beginning of these silver coinages have been set forth in the numismatic literature of the past three decades. Kagan in fact freely quotes from this literature, while passing over its substance in silence, apparently persuaded, as he says, that numismatists have yet to present their case convincingly.[4] Whether or not this is so, it is true that—as in all areas of scientific research—the fundamental technical studies have been addressed primarily to specialists in the field. And, even among these specialists, a small minority led by H.A. Cahn has continued to champion the traditional "high" chronology based on the literary references to Pheidon and Solon.[5] Therefore, we here summarize the case for the "low" chronology for a wider, non-specialist audience and underscore certain key arguments that unconvinced scholars have either underestimated or overlooked.

In general terms, the traditional "high" chronology begins with the literary testimonia regarding Pheidon and Solon and simply develops a numismatic chronology to fit these references. The "low" chronology, on the other hand, starts with the fact that particular late stages in the archaic coinages of Aegina, Corinth and Athens are empirically anchored in the late sixth and early fifth centuries B.C., and proceeds to work back from these points as far as the evidence of the coinage allows. Such evidence is especially plentiful and informative in the case of the archaic coinage of Athens, which we take up first before turning to Corinth and Aegina.

ATHENS

Proponents of the high chronology argue that Athenian coinage must have begun in the seventh century since Androtion and the Aristotelian *Athenaion Politeia* both attest that Solon was responsible for a reform of the coinage in the early sixth century. But while Androtion and the *Ath. Pol.* do clearly attribute to Solon a change in the *nomisma* (money in general *or* coinage proper), the surviving coinage of the sixth century B.C. cannot be connected with their accounts.

Androtion (fourth century B.C.), quoted in Plutarch's *Life of Solon* 15, speaks of Solon's

> augmentation of the measures and the purchasing power of the *nomisma*. For he made the mina to consist of a hundred drachmas, which before had contained only seventy, so that by paying the same amount (*sc.* of money), but (money) of a lesser value, those who had debts to discharge were greatly benefited, and those who accepted such payments were no losers.[6]

In other words, the change in the *nomisma* apparently consisted of a 100:70 or 30 percent reduction in the weight standard of the drachma.

The slightly later *Ath. Pol.*, chapter 10, attributes to Solon

> an augmentation of the measures and the weights and the *nomisma*. For under him (a) the measures became greater than the Pheidonian measures and (b) the mina, previously having the weight of seventy drachmas, was filled up to one hundred drachmas. (c) The ancient denomination was the didrachma. (d) He also established weights corresponding to the *nomisma*, at the rate of 63 minas to a talent, and the three (additional) minas were distributed among the stater and the other units of weight.[7]

According to some commentators, the clause that explains the augmentation of the *nomisma* is (c), which would imply that the augmentation was an increase in denomination from the old didrachm coins to the tetradrachm.[8] Other scholars, however, have variously seized on (d), which deals with the relation of trade weights to coin weights, or (b) to explain Solon's reform as either an increase or (in keeping with Androtion) a reduction of the weight standard of the drachma.[9]

[4] Kagan 1982:360.

[5] Cahn 1971:86–88; Cahn 1977:283–84.

[6] Translation of B. Perrin, *Plutarch's Lives* 1 (Loeb Classical Library, Cambridge, Mass. and London 1914), with minor alterations. Emended text as printed by P.J. Rhodes, *A Commentary on the Aristotelian* Athenaion Politeia (Oxford 1981) 164:
. . . τῶν τε μέτρων ἐπαύξησιν καὶ τοῦ νομίσματος τιμῆς. ἑκατὸν γὰρ ἐποίησε δραχμῶν τὴν μνᾶν, πρότερον ἑβδομήκοντ' ἄγουσαν, ὥστ' ἀριθμῷ μὲν ἴσον, δυνάμει δ' ἔλαττον ἀποδιδόντων, ὠφελεῖσθαι μὲν τοὺς ἐκτίνοντας μεγάλα, μηδὲν δὲ βλάπτεσθαι τοὺς κομιζομένους.

[7] *τήν τε τῶν μέτρων καὶ σταθμῶν καὶ τὴν τοῦ νομίσματος αὔξησιν. ἔπ' ἐκείνου γὰρ ἐγένετο καὶ τὰ μέτρα μείζω τῶν Φειδωνείων, καὶ ἡ μνᾶ, πρότερον ἔχ[ο]υσα [σ]ταθμὸν ἑβδομήκοντα δραχμάς, ἀνεπληρώθη ταῖς ἑκατόν. ἦν δ' ὁ ἀρχαῖος χαρακτὴρ δίδραχμον. ἐποίησε δὲ καὶ σταθμὰ πρὸς τ[ὸ] νόμισμα, τ[ρ]εῖς καὶ ἑξήκοντα μνᾶς τὸ τάλαντον ἀγούσας, καὶ ἐπιδιενεμήθησαν [αἱ τ]ρεῖς μναῖ τῷ στατῆρι καὶ τοῖς ἄλλοις σταθμοῖς.* (Teubner ed.).

[8] See, e.g., Cahn 1946:136–38; C.M. Kraay, "An Interpretation of *Ath. Pol.* Ch. 10," in Kraay and G.K. Jenkins eds., *Essays in Greek Coinage Presented to Stanley Robinson* (Oxford 1968) 5–9.

[9] For increase, see, e.g.: K. Kraft, "Zur solonischen Gewichts- und Münzreform," *JfNG* 19 (1969) 7–24; for reduction (which would cause an increase in the number of drachmas obtained from

When we turn to the extant coinage of Athens, however, we find that no change in weight standard can be documented. The coinage began with a drachma of "Euboic-Attic" weight of about 4.3 g., and this standard remained in effect down through the Hellenistic period.[10] There was a change in the major denomination from the didrachm to the tetradrachm, but it occurred long after Solon, as did the beginning of Athenian coinage itself. This last point is particularly critical. For if the coinage did go back to the early sixth century, some scholars might be tempted to argue that prior to Solon the Athenians employed Aeginetan coins, which were heavier than Athenian by the same 7:10 ratio mentioned in the above passages, and that Solon was therefore responsible for instituting the lighter Attic coins in their place.[11] Since this hypothesis is the only one that can plausibly allow for a Solonian reform of coinage, it is necessary to survey the numismatic evidence for chronology.

At the outset we cannot emphasize too strongly that such evidence is entirely self-contained and, contrary to the impression given by Kagan, independent of the dating of the earliest coins of Ionia and Lydia. The evidence consists in the first instance of 1) the relative chronology of the unusually varied and well studied archaic Athenian coins themselves, 2) the hoards in which many of the coins have been found and through which certain later stages of the relative chronology can be fixed in time, and 3) the relative volume of the coinage in its several stages insofar as this can be deduced from the number of dies expended in the production of the coins. The relative chronology, based on the typological and stylistic groupings of Seltman's 1924 corpus, was established by Kraay by analysis of various typological and technical details (e.g., size and thickness of the flans, the letter-forms of the AΘE legends, the arrangement of the olive sprays on the reverses of the owl coins, etc.) and by the sequence in which the various groups of the coinage entered into hoards.[12] We summarize this hoard information in Table I, where it can be seen at a glance that the earliest group (I) appears alone in two hoards, that it is joined by the following typological group (II) in a subsequent hoard, that Groups I and II are later joined by III, and so on. Since the relative chronology suggested by typological considerations is confirmed by the identical relative chronology implied by the hoards, Kraay's arrangement of the groups must be judged correct.

Some of the hoards are of course more securely dated than others, but for our purposes it is enough to note that most of the hoards listed in Table I are firmly anchored in the early part of the fifth century. The crucial Taranto hoard, for example, contained a Thebes/Chalcis alliance coin probably of 506 and coins of Metapontum that had technically advanced beyond the stage of thin, wide flans that was current throughout South Italy at the time of the destruction of Sybaris in 510; a hoard date after 506 and probably around or a little later than 500 is thus assured.[13] The later Gela, Asyut, South Anatolian and Zagazig hoards all have as termini post quos one or more coins minted by the Samians who briefly took over Zancle in the late 490s[14]; and the Asyut hoard contained a coin of Alexander I of Macedon, whose reign began also in the 490s.[15] The coins from the Athenian Acropolis hoard must date before 480 since they were excavated from the Persian destruction debris of that year and were badly damaged, presumably by fire.[16]

Athenian coinage begins with the so-called Wappenmünzen (Group I), a series of didrachms and accompanying smaller denominations that were struck with a changing device on obverses and a typeless incuse square punch on reverses.[17] There are 14 differ-

a given quantity of silver): F. Jacoby, *FGrHist* 3b (suppl.) II 466–67, citing Festus, s.v. *Sextantari asses*. Although it is not our purpose here to attempt any final interpretation of the *Ath. Pol.* and Androtion texts, it will be clear from our remarks infra that we find Jacoby's approach the most persuasive in terms of what Solon may have actually accomplished.

[10] Seltman (7–15) got around this difficulty by attributing to Athens a group of Aeginetan-weight coins with an amphora obverse and incuse-square reverse (Seltman pl. I, Group A) and proposing that they antedated Solon's monetary reform. But although such coins bear a superficial resemblance to the Attic Wappenmünzen with amphora obverse (Seltman pl. I.A6–7; *ACGC* pl. 9.161), the design of their reverse punch so clearly dissociates them from the Wappenmünzen that Seltman's attribution has been universally rejected; see E.S.G. Robinson's review of Seltman, *NC* ser. 5.15–16 (1924) 332–34, and J.H. Jongkees, "Notes on the Coinage of Athens," *Mnemosyne* ser. 3.12 (1945) 81–83. In all probability the coins belong to Carthaea on Ceos.

[11] So *HN*[2] 366; Jongkees (supra n. 10) 83–87.

[12] "Owls" 44–55. Kraay's typological groups are here denoted by Roman numerals, after the precedent of Price and Waggoner 56–68.

[13] For full bibliography (to 1972) of this and all other hoards listed in Tables I and II, see the entries in *IGCH*, to which should be added the important chronological review of these hoards in Price and Waggoner 16–22. For the Thebes/Chalcis coin: *ACGC* 90, pl. 15.266. For the post-510 date of the reduced-flan coins of Metapontum: *ACGC* 162–66, 170, pl. 34.589–92.

[14] J.P. Barron, *The Silver Coins of Samos* (London 1966) 40–45, and *ACGC* 213, n. 2.

[15] There are reasons for dating the coin of Alexander I after ca. 475 (C.M. Kraay, "The Asyut Hoard: Some Comments on Chronology," *NC* ser. 7.17 [1977] 190–93; Cahn 1977:284), which would require a lowering of the date of ca. 475 for the Asyut hoard advocated by Price and Waggoner.

[16] To the hoard bibliography in *IGCH*, add Kroll 18, n. 51, where it is suggested that the Wappenmünzen and the owls in the Acropolis find may represent two separate Acropolis dedications.

[17] Seltman pls. 1–4 (Groups B and D); *ACGC* pl. 9.161–72; Kroll pls. 1–2.1–15.

TABLE I: Hoards Significant for the Chronology of Archaic Athenian Coinage

				Classifiable Athenian coins by Groups (and, in parentheses, Seltman's Groups)						
				Wappenmünzen	"Unwreathed" Owls					"Wreathed" Owls
Hoard	*IGCH* No.	Termini	Date	I (B, D, K)	II (H)	III (L)	IV (M+G)	V (C+F)	VI (E)	VII (N)
Attica	2		ca. 525–515	18+						
Sakha (Egypt)	1639		ca. 500–490	2						
Taranto (Italy)	1874	after 506	ca. 500–490	2	5					
Benha (Egypt)	1640		ca. 490–485	1	4	2				
Asyut (Egypt)	1644	after ca. 490	ca. 475 or later	2		7	154			
Gela (Sicily)	2066	after ca. 490	ca. 480		2–4	2	134	31		
South Anatolia	1177	after ca. 490	ca. 480–475				6	13		
Athens Acropolis	12	in or before 480	480	17		1	2	4	30	
Zagazig (Egypt)	1645	after ca. 490	after 470				3+	4+		18

ent, changing devices in the didrachm series, representing 14 separate issues of the coinage.[18] During the last two issues the didrachms are joined by tetradrachms, which bore the innovation of a type on both sides: an unchanging emblem of Athens (the gorgoneion of Athena's aegis) on the obverse and the changing issue device now relegated to the reverse.[19]

The coinage was then redesigned through the substitution of the familiar Athena/owl types. The earliest of the archaic owl tetradrachms (Group II) are technically related to the Wappenmünzen tetradrachms through their wide, flat flans and small reverse incuse squares and are distinguished by the fineness and diversity of their die-cutting.[20] They first show up in a dated context in the Taranto hoard, around 500–490. After another relatively fine but more homogeneous group (III),[21] a decline in artistic quality begins to set in at the same time as the volume of production dramatically increases.

Speaking relatively, the Wappenmünzen and the Group II and III owls were issued in small to moderate quantities. According to Seltman's 1924 catalogue and Hopper's 1968 supplement, all but three of the 14 Wappenmünzen didrachm issues were minted from

[18] Kroll 23, with 32, nos. 1–14.

[19] Seltman pl. 14 (Group K); *ACGC* pl. 9.173–74. For the significance of the gorgoneion type and the sequence of the tetradrachm and accompanying didrachm issues, see Kroll 10–13.

[20] Seltman pls. 13–14 (Group H); *ACGC* pl. 10.175–78.

[21] Seltman pl. 15 (Group L); *ACGC* pl. 10.179–80.

one to four known obverse dies.[22] The Wappenmünzen tetradrachms are represented by only six obverse dies in Seltman, and the Group II and III owls by only 14 and 15 obverse dies respectively. In contrast, Seltman identified 124 obverse dies for the owls of Group IV.[23] And although all these die-counts will grow as new coins are added to Seltman's list, the only substantial increase that has been noted over the nearly sixty years since the publication of his catalogue has been in Group IV, whose obverse dies are now estimated to have numbered probably well in excess of 200.[24] The Group IV owls were clearly mass-produced in vast quantities, a circumstance that accounts for their progressive stylistic degeneration as well as for the large number of specimens in the Asyut and Gela hoards (see Table I).

The degeneration continues through Group V (31 obverse dies in Seltman)[25] and reaches bottom in the Group VI owls (28 dies),[26] whose utterly "barbarous" die-cutting has been suggestively attributed to blacksmiths pressed into service when a great amount of silver had to be coined with all possible haste. On the evidence of the Acropolis hoard, the Class VI owls must have been produced before the evacuation of Attica in 480. The characteristic design of their reverse olive sprays links them to the Group VII owls,[27] to which a new detail of a row of four olive leaves is added on Athena's visor. Since these "wreathed" owls do not show up in any hoard datable before 480, and since the addition of the obverse olive leaves is plausibly interpreted as commemorating Athens' success over the Persians, there is good reason to conclude that Group VII represents the resumption of Athenian coinage after the Persian defeats of 480 and 479.[28] Accordingly, the inept die-cutting of Group VI presumably reflects the urgency of the final preparations for meeting the Persian attack.

The fact that the earliest (Group II) owls are not present in hoards before 500 strongly suggests that they did not begin very long before that date. Kraay, impressed by the need to accommodate the voluminous coinage of Groups IV, V and VI before 480, estimated that Group II began as early as ca. 525–520.[29] Others, however, have argued that in view of the tremendous amount of silver being mined at Laurion in the 480s,[30] Groups IV–VI could be compressed and that a date of ca. 515 or even 510 or 506 for the institution of the owl types is preferable on iconographic and historical grounds.[31] The several iconographic interpretations that have been adduced for linking the Group II or Group III owls with events in late sixth century Athens are necessarily speculative and need not delay us here. The important deduction is that the owl types are unlikely to have been adopted any earlier than ca. 525.

A skeptic might reply that the Taranto hoard of ca. 500–490 gives nothing more than a terminus ante quem and that the Group II owls could just as well be placed in the mid- or earlier sixth century. As Cahn and Kagan remind us, it is not uncommon to find in fourth century and Hellenistic hoards coins that had been circulating for as much as a century or more before being buried.[32] But for the question at hand, this observation would be irrelevant: such old coins show up also in much earlier hoards as well as in hoards of the 300s or later, whereas the Group II owls appear for the first time around 500. Moreover, whereas old coins in fourth century and Hellenistic hoards are on the whole heavily worn from their long circulation, the five Group II specimens in the Taranto hoard are uniformly in a mint-fresh or nearly mint-fresh condition,[33] having circulated little before being buried. One must remember finally that it is not just the Group II phase of the owls whose initial time of circulation is documented by several hoards of the early fifth century, but also the successive Group III and IV phases. If one were to raise the date of Group II much before ca. 525, the dates of the later owl groups should

[22] R.J. Hopper, "Observations on the *Wappenmünzen*," in *Essays . . . Robinson* (supra n. 8) 26–36, 38. For a tabulation by issues, see Kroll 22.

[23] Seltman pls. 16–17 (Group M), 7–12 (Group G); *ACGC* pl. 10.181–82.

[24] Price and Waggoner 63; Cahn 1977:283, with reference to the 154 Group IV tetradrachms in the Asyut hoard.

[25] Seltman pls. 2–3 (Group C), 6–7 (Group F); *ACGC* pl. 10.183–84.

[26] Seltman pls. 5–6 (Group E); *ACGC* pl. 10.185–86.

[27] Seltman pls. 18–19 (Group N); *ACGC* pl. 11.187; C.G. Starr, *Athenian Coinage 480–449 B.C.* (Oxford 1970) pls. 1–2 (Group I).

[28] "Owls" 55–58; Starr (supra n. 27) 3–7, 11; *ACGC* 61–62, 65.

[29] "Owls" 55–58; Kraay, "The Early Coinage of Athens," *NC* ser. 7.2 (1962) 418, 420; *ACGC* 61, 355 (*ad* no. 175).

[30] In 483/2 Athens had on hand a profit of 100 talents from the mines at Laurion and especially from the rich strike in the Maroneia district (Hdt. 7.144; *Ath. Pol.* 22.7). If, as in the fourth century (R.J. Hopper, "The Attic Silver Mines in the Fourth Century," *BSA* 48 [1953] 227–31, 237–38), this revenue consisted only of the rents on the state-owned leases paid by the private speculators who worked the mines, the actual amount of silver being produced before 483/2 must have been many times greater than the 100 talents taken in by the state. See W.P. Wallace, "The Early Coinages of Attica and Euboia," *NC* ser. 7.2 (1962) 28–31. It is reliably estimated that 15–25 obverse tetradrachm dies were needed to mint 100 talents of silver (R.W. Mathisen, "Antigonus Gonatas and the Silver Coinage of Macedonia circa 280–270 B.C.," *ANSMN* 26 [1981] 117–18, n. 66).

[31] In favor of ca. 515: P. Bicknell, "The Date of the Archaic Owls of Athens," *AC* 38 (1969) 175–80; Kroll 24–30. In favor of 510 or 506: Wallace (supra n. 30) 23–28; Price and Waggoner 64–66.

[32] Cahn 1971:82; Kagan 1982:359, n. 144.

[33] E. Babelon, "Trouvaille de Tarente," *RN* 1912, pl. 1.9–12 (cf. Seltman 190, no. 287a).

rise with it, bringing at least part of the vast Group IV coinage before the time of the Taranto hoard. But specimens of this profusely minted coinage are conspicuously absent from the latter and do not appear in fact until after 490 in the Gela hoard, making it probable that, while Group II was fairly recent around 500–490, Group IV did not commence until around 500–490 or sometime thereafter.

The truth is that no one has ever proposed to date the Group II owls prior to ca. 525. Before Kraay's analysis, scholars commonly assumed that the archaic owls began much earlier and gradually evolved from the relatively crude-looking Group VI or IV coins at the start of the series down to the fine Group II and III coins at the end, in the late sixth and early fifth centuries. Although Cahn still advocates this reverse relative chronology,[34] it is disproved by the typological and hoard evidence outlined above and can no longer be accepted. But even Cahn agrees that the owls of Group II must fall around the 520s, and in this he is joined by Babelon, Seltman and all others who have dated the highly artistic obverses of Group II through comparisons with Attic vase-painting and sculpture.[35] Rarely in numismatic scholarship does one find the kind of unanimity that has attended the general chronology of the Group II owls. Art historical considerations converge with the independent implications of the hoards to establish their date in the last quarter of the sixth century.

From here the absolute chronology of the Wappenmünzen (Group I) is obtained by working backward. As stated, the Wappenmünzen tetradrachms are the immediate precursors of the Group II owls and, along with the late Wappenmünzen didrachms (with gorgoneion obverses) that accompany the tetradrachms,[36] must date therefore in the vicinity of 525. Since the tetradrachms were manufactured from only six known obverse dies and in only two issues (one with the reverse device of a bull's head, the other with a lion's head reverse), they are not likely to have been minted for more than a few years. Their close relationship to the early owl tetradrachms is underscored by the fact that specimens of the Wappenmünzen tetradrachms occur along with Group II or III owls in the Taranto, Benha and Asyut hoards.

As for the Wappenmünzen coinage as a whole,

[34] Cahn 1971, with Cahn 1946 and Cahn 1977:283–86. Cahn's chronology rests on his contentions that (a) the Wappenmünzen do not entirely precede the owls but were minted for domestic consumption as a parallel coinage alongside the owls, which were struck exclusively for foreign trade; (b) the wear of the owls in the Gela hoard shows them to be much older than the Sicilian coins in the hoard; (c) the archaic owl coinage is throughout an "artistic" coinage, whose obverse Athena heads may in every instance be dated absolutely with reference to Athenian vase-painting and sculpture; and (d) on the authority of *Ath. Pol.* 10 (and, according to Cahn 1971:87, Androtion), Solon inaugurated the (owl) tetradrachms.

Cahn (1971:85) concedes, however, that (a) has to be accepted as an "anomaly" since it goes against reason. We would add that it also goes against the evidence of the hoards (*IGCH* nos. 3, 5, 9 and 10, in addition to those here listed in Table I, which imply that the owls did not circulate until after the Wappenmünzen series was completed), and against the results of metallurgical analysis which show that until their latest phases the Wappenmünzen were struck from non-Attic silver, whereas the early owl coinage was produced from Laurion silver (Kroll 13–15; N.H. Gale, W. Gentner, and G.A. Wagner, "Mineralogical and Geographical Silver Sources of Archaic Greek Coinage," in D.M. Metcalf and W.A. Oddy eds., *Metallurgy in Numismatics* [London 1980] 26 [Table 6], 29–33, 49). As remarked by M.J. Price ("The Uses of Metal Analysis in the Study of Archaic Greek Coinage: Some Comments," *Metallurgy in Numismatics* 51), "(i)t is most unlikely that silver from a particular source was reserved for the owls and other silver for Wappenmünzen, and it is much more likely that the Wappenmünzen of different ores were in fact a chronologically different coinage."

(b) is more difficult to assess since so little of the Gela hoard has been published and because it is frequently impossible to distinguish genuinely worn coins from coins that were imperfectly struck or minted from worn dies. The British Museum has silver foil impressions of 112 Athenian coins from the Gela hoard, and we are grateful to M.J. Price for examining them and communicating the following remarks (*per ep.*, 15 March 1983): "The Athenian coins have very much the look of the Asyut pieces, and I would entirely support your suggestion that signs of wear are in part environmental—i.e., in cleaning, the original surface of the coins has been removed in many cases—and in part technical—i.e., in striking such thick lumps of silver, the obverse in the anvil has not always received sufficient power in the blow to press the flan into the engraved type. I would recommend that these coins be studied for wear particularly on the reverse, bearing in mind that the depth reached by the punch die must be at least equal to the depth of engraving at the deepest point for the design to be struck without any 'flattening' of the highest relief points." The greater overall "wear" of the Athenian material in the hoard noted by G.K. Jenkins, *The Coinage of Gela* (Antike Münzen und geschnittene Steine 2, Berlin 1970) 20–21, 151, pl. 36, would seem therefore to be the result of the hurried, mass production of the later archaic owls rather than of any prolonged circulation.

As for style, (c), since Athens' coinage in the later fifth, fourth and third centuries was never in step with the latest currents of Greek artistic development, why should the bulk of her archaic coinage be any different? Price and Waggoner (66–68) show that the treatment of Athena's eye, ear and hair on the owls of Group II through IV underwent a progressive stylization similar to the stylization one finds in the evolution of numerous other ancient coinages, like the early denarius coinage of Rome, to take only the best known example: once the denarius began to enjoy a wide circulation and to be mass produced in increasing quantities, the exquisitely engraved dies of the earliest issues came to be copied by second- and third-rate die-cutters, whose own hasty copies were in turn copied by others, causing a progressive degeneration of style (compare C.H.V. Sutherland, *Roman Coins* [New York 1974] fig. 50 with figs. 54, 58, 60, 66 etc.). On this phenomenon, see further O.E. Ravel, "The Classification of Greek Coins by Style," *NC* ser. 6.5 (1945) 123–24.

[35] Cahn 1975:85, 88 (no. 5); Cahn 1977:285; E. Babelon, *Traité des monnaies grecques et romaines* 2.1 (Paris 1907) 742–62, with plates; C. Seltman, *Masterpieces of Greek Coinage* (Oxford 1949) 31. For further citations, see "Owls" 58, ns. 5–6. For complementary chronological evidence involving details of helmets on the owls and Attic painted pottery, see "Owls" 52; R.T. Williams, "The 'Owls' and Hippias," *NC* ser. 7.6 (1966) 9–12.

[36] Kroll 11–13.

Kraay, noting that the didrachm series is represented by only "about a dozen types" and "by no more than about forty obverse dies," reasoned in 1956 that

> the rate of use can hardly have been lower than one obverse die a year, and, if an allowance of ten years be added to cover the possibility that in some years no coins were minted, a maximum period of about fifty years for the issue of "wappenmünzen" is reached, which would mean that they began about 575 or later.[37]

In a footnote, Kraay emphasized "that this is quite a generous calculation, and that the period might well be shorter."[38] Accordingly, in 1976, he opted for a starting date around the middle of the sixth century, i.e., during the early years of Peisistratus' tyranny, a dating that had come to be advocated by others.[39]

To a certain degree this Peisistratid dating rests on an argument from historical probability. With the terminal date of the Wappenmünzen fixed by the beginning of the owl coinage in the last quarter of the century, the Wappenmünzen, as Kraay observed, "must be very largely the coinage of the Peisistratid tyrants."[40] And if largely a Peisistratid coinage, why not wholly a Peisistratid coinage, especially since Peisistratus' innovative administration presents a plausible historical context for the establishment of coinage at Athens? But all such argumentation aside, the very fact that the Wappenmünzen didrachms are conveniently divided into 14 issues itself requires that the coinage could not have commenced much, if at all, before mid-century.

The Wappenmünzen are only one of numerous Greek civic coinages characterized by changing issue types or issue symbols. Like the changing names of magistrates that distinguish the successive issues of other Greek coinages, such types or symbols served in general as administrative control marks for identifying the batch of coins minted over a limited period of time under the authority of the particular official (or board of officials) responsible inter alia for maintaining the coins' appropriate weight and fineness of alloy. The types or symbols thus changed with each change of minting officials or administrative period, and since throughout Greece administrative arrangements were normally organized on an annual basis, with magistrates holding office for a single year, one assumes that the administrative periods denoted by changing types, symbols, or names were normally annual as well. In fact in several instances—as with the changing types of Cyzicene electrum coins, the changing types of the joint electrum coinage of Phocaea and Mytilene, the changing reverse types of Abderite silver coins, and the changing symbols of the New Style silver coins of Hellenistic Athens, to cite only four cases—we have good evidence that changing types or symbols did change annually in keeping with an annual term of mint administration.[41]

There is no reason why the changing devices of the Wappenmünzen should be excepted from this general principle of annual change.[42] On the whole, the didrachm issues were small, most of them having been manufactured from only one to three obverse dies, precisely as one would expect for issues of one year's duration. Thus if, on analogy with many other Greek

[37] "Owls" 64–65. Today, however, the number of obverse didrachm dies falls between 49 and 56 (Hopper [supra n. 22] 38, no. "e," and Kroll 19, n. 56). On the minimalist principle of one die per year, see infra n. 64.

[38] "Owls" 65, n. 1.

[39] *ACGC* 58, following Wallace (supra n. 30) 36; Price and Waggoner 66.

[40] *ACGC* 58.

[41] Cyzicus: *ACGC* 261—approximately 200 changing types in a period of slightly more than 200 years. Phocaea-Mytilene: F. Bodenstedt, *Die Elektronmünzen von Phokaia und Mytilene* (Tübingen 1981)—189 emissions in the 206 years of Periods II–III (521–326 B.C.). Abdera: R.R. Holloway, review of J.M.F. May, *The Coinage of Abdera* (London 1966), in *AJA* 71 (1967) 321; *ACGC* 153–56. Athens New Style and the annual principle in general: Kroll 21. For a small sampling of other coinages, all from the pre-Hellenistic era, with changing symbols or changing magistrates' names denoting issues probably of a year's duration (or less), see *ACGC* 100 (4th c. Sicyon), 112–14 (4th c. Boeotia), 129 (4th c. Corcyra), 138 (4th c. Chalcidian League), 158–60 (5th–4th c. Ainos), 241, 255 (5th–4th c. Samos), 256 (4th c. Ephesus, with magistrates' names lasting for less than a year), 257 (4th c. Rhodes). Whether the Wappenmünzen types were the personally selected symbols of individual "moneyers" (as argued by Kroll 2–10, and O. Picard, "Les monnaies marseillaises aux types d'Auriol, et les monnayages grecs à types multiples," *Bulletin de la Société Française de Numismatique* 36 [1981] 53–55) or were chosen by some higher authority in the state (as argued for the changing types of Cyzicus, Phocaea, Mytilene and Abdera by A.E. Furtwängler, "Griechische Vieltypenprägung und Münzbeamte," *SNR* 61 [1982] 19–24), the essentially administrative purpose of the types for distinguishing successive issues remains unaffected.

[42] From time to time it has been suggested, although never seriously discussed from a monetary point of view, that the Wappenmünzen were issued only at four-year intervals at the time of the Greater Panathenaea, a supposition that would date their inauguration to 566/5 (when the festival was organized on a quadrennial basis; L.A. Deubner, *Attische Feste* [Berlin 1932] 23). See N. Yalouris, "Athena als Herrin der Pferde," *MusHelv* 7 (1950) 52–55; "Owls" 65, n. 1; Hopper (supra n. 22) 26; Cahn 1971:84; *ACGC* 59. The argument, as detailed by Yalouris, is fundamentally iconographical and assumes that the Wappenmünzen amphora, horse, triskeles and wheel devices are necessarily agonistic in character. But are they? The associations of the olive-oil amphora with the Athenian economy and of horses with the Athenian gentry are, for example, too general to require a connection with the Panathenaic games. There is nothing agonistic in the beetle, bull's head and lion-head types. And the Greek agonistic symbol par excellence, a Nike, is missing from the list of Wappenmünzen designs. The chief weakness of the festival theory, however, is to be found in its implausible monetary implications: could the needs of the quadrennial festival have been so great and other ordinary economic needs of the state so insignificant that new coinage was required only at the time of the festival?

coinages with changing types or symbols, each Wappenmünzen device did denote the coinage of a single year, Kraay's original 50-year maximum estimate for the Wappenmünzen would be overly generous indeed. The coinage need not have spanned more than 14 years, although a more realistic estimate, which allows for occasional years when no coinage was needed or struck and perhaps other years that might be represented by possible Wappenmünzen types on denominations smaller than a didrachm,[43] should probably be in the neighborhood of two or (at the most) three decades. Counting back from the Group II owls in the last quarter of the century, the start of the Wappenmünzen would fall around the middle of the century or shortly thereafter.

It might be objected that the foregoing chronology is essentially inferential and that the 14 didrachm issues could still be stretched over 70 or 80 years back to the time of Solon's legislation in the 590s. From a strictly logical point of view this is, of course, true. Yet the methodological question here is not one of logical possibility, but of numismatic probability based on what can be deduced from the comparative chronologies of better understood Greek coinages with changing types or symbols. And within these terms, given the two alternatives—the 70–80 years needed to extend the Wappenmünzen back to Solon or the 20–30 years that bring the coinage no farther than mid-century and the tyranny of Peisistratus—the latter chronology is overwhelmingly and conclusively to be preferred, as it is from a technical point of view. Prior to the tetradrachms, the Wappenmünzen show virtually no stylistic or technological development. For a coinage lasting only two or three decades this is understandable, but for a period of 70–80 years it would be without parallel in any other coinage of the Greek world.

How then is one to understand the literary evidence pertaining to a Solonian reform of the *nomisma*? It would be hazardous to maintain that the tradition of the reform was mere invention, for the laws of Solon were available to scholars in the fourth century B.C.,[44] and arguably served as the primary source for what Androtion and, in part, the *Ath. Pol.* have to say about Solon's revision of the measures, weights and *nomisma*. From what other source, one wonders, could information about a Solonian revision have been known? Moreover, it is clear from ancient references to the laws of Solon that the Athenian economy in Solon's time was a monetary economy employing silver as the means of exchange. At *Ath. Pol.* 8.3 we read:

> Therefore in the laws of Solon that are no longer in force it is often written that "the *naukraroi* are to levy . . ." and "are to spend out of the naukraric silver."[45]

Lysias 10.18 quotes in full a law of Solon on usury that similarly refers to money as "silver."[46] And Plutarch's *Life of Solon* (23) contains a long and detailed discussion of certain fines, prices and monetary awards found in Solon's laws, the prices of sacrificial victims being specifically cited from the sixteenth *axon* of the laws. The fines, prices and awards are all expressed in drachmas, which can hardly be other than drachmas of silver, as Plutarch implies when he refers to the monetary fines as "silver fines" (*argyrías zēmías*). Inasmuch as coinage proper was not introduced in Attica until about half a century after Solon, it follows that these drachmas must have been drachma weights of uncoined or bulk silver.[47]

We conclude that, while Solon could have had nothing to do with coinage, a Solonian monetary reform is readily intelligible within the context of the pre-coinage but silver-using economy of early sixth century Athens. The terms of such a reform may well have been written down as one of Solon's laws and may well have involved a 30% reduction of the weight of the drachma, as Androtion and a clause of the *Ath. Pol.* suggest. The drachma in question, however, would have been a weight denomination, not a coin denomination. And indeed the reform itself would have been essentially a reform of weights alone, since in an economy based on transactions through the weighing out of silver, any modification of the weight system was ipso facto a modification in the monetary system.

The extent to which Androtion and the author of the *Ath. Pol.* were aware of this is a matter of historiographical rather than historical interest. Both writers connect Solon with *nomisma*, which after the introduction of coins became the conventional term for coinage. But the root meaning was "anything sanctioned by current or established usage" (*LSJ*), and in a monetary context *nomisma* could denote currency or legal tender of any kind. Plutarch's *Life of Lysander* (17.2–3) speaks of the iron *nomisma* of the Spartans, which was surely not iron coinage, but, as Plutarch

[43] Kroll 23, n. 67.

[44] E. Ruschenbusch, ΣΟΛΩΝΟΣ ΝΟΜΟΙ (*Historia* Einzelschriften 9, Wiesbaden 1966) 1–14; R. Stroud, "State Documents in Archaic Athens," in *Athens Comes of Age* (Papers of a Symposium Sponsored by the AIA, Princeton 1978) 26–27.

[45] διὸ καὶ ἐν τοῖς νόμοις τοῖς Σόλωνος οἷς οὐκέτι χρῶνται πολλαχο[ῦ γέ]γραπται, "τοὺς ναυκράρους εἰσπράττειν", καὶ "ἀναλίσκειν ἐκ τοῦ ναυκραρικοῦ ἀργυρ[ίο]υ" (Teubner ed.).

[46] Τὸ ἀργύριον στάσιμον εἶναι ἐφ' ὁπόσῳ ἂν βούληται ὁ δανείζων.

[47] Rhodes (supra n. 6) 152–53, 168.

explains, a money of iron spits.[48] To be sure, *nomisma* in *Ath. Pol.* 10 must be understood as "coinage," since the passage goes on to speak about the *charactēr* (coin "stamp," hence in this context coin "denomination") of the *didrachmon* (which is unknown as a denomination of Athenian weights) and about coin weights as distinct from trade weights. In the passage from Androtion, on the other hand, the generic, less prejudicial interpretation of *nomisma* as "money" fits the sense admirably, as Perrin's Loeb translation ("augmentation of the measures and the purchasing power of the money") makes clear. Androtion does not say that Solon actually modified the *nomisma*, only that there was a modification of the *timē* or value of the *nomisma* along with the modification of the measures. Indeed, by associating the revision of the *metra*, which here presumably means measures of weight as well as of capacity, with a revaluation of the *nomisma*, Androtion would seem to reflect accurately the genuine circumstance of the Solonian reform in which the latter was the immediate and inevitable consequence of the former.

The mid-sixth century date of the earliest Athenian coins therefore conflicts neither with Androtion as he is quoted by Plutarch nor with the probable reality of Solon's monetary reform. The only conflict is with the coinage *nomisma* of *Ath. Pol.* 10. But, as Rhodes has written in his judicious discussion of that chapter, "(s)ince coins were named after the weights of silver which they represented, if there was no record of when coinage had been introduced it was easy to assume that Solon must have reformed Athens' coinage as well as her weights."[49] Surely there was no such record if Plutarch in his *Life of Theseus* (25.3) could believe that coins were struck by this early king of Athens[50] and if other writers could attribute the invention of coinage to the still earlier Athenian heroes Erichthonius or Lycus (Pollux 9.83).

No one today would argue that shekel coins were minted in second millennium Mesopotamia just because the Laws of Eshnunna and Hammurabi happen to specify prices, wages, compensation, interest on loans, etc. in silver shekels,[51] or that the Romans were using a bronze coinage in the fifth century B.C. because penalties and manumission payments were expressed in bronze *asses* in the Law of the Twelve Tables.[52] Such monetary denominations, again, must be the denominations of the weights used in weighing money in the form of uncoined metal; for, although the terminology of these early law codes certainly brings later coin denominations to mind, the numismatic record proves that no shekel coins existed before the Greek period and that the Romans did not mint *as* coins until the third century.[53] One could legitimately connect the earliest coins of Athens with Solon's lawgiving only if the numismatic evidence for the chronology of the coins were ambiguous. But it is not, and their date around or, most likely, soon after the middle of the sixth century should stand as one of the more secure points in the chronology of archaic Greek coinage overall.

CORINTH

The chronology of the archaic Pegasus staters of Corinth is a good deal more straightforward. The coins of the earlier series (Group I in Ravel's corpus[54]) have a simple incuse punch reverse, at first (Group I.1) with a pattern derived from the "Union Jack" reverses of Aeginetan coins, later (Group I.2) in a swastika configuration, and finally (Group I.3) with a simplified swastika design. In Group II, reverses are stamped with a true reverse type—a helmeted head of Athena.[55]

In the late nineteenth and early twentieth centuries, when the criteria for dating archaic coinages were far more limited than they are today, the start of Group I was placed in the third quarter of the seventh century, at the time of the tyrant Cypselus, and period II was believed to have begun as late as ca. 500 because of the similarities of the Athena heads of Group II to female heads on late sixth and early fifth century coins of Athens, Syracuse and some other Greek states.[56]

The validity of this last determination is now fully confirmed by more objective evidence. A stater that belongs about midway in Group I.2[57] was struck over

[48] See also Plutarch, *Life of Lycurgus* 9; Pollux 7.105, 9.77, 79.

[49] Rhodes (supra n. 6) 168.

[50] See Jacoby, *FGrHist* 3b (suppl.) I.566–69; Rhodes (supra n. 6) 169.

[51] J.B. Pritchard, *The Ancient Near East* 1. *An Anthology of Texts and Pictures* (Princeton 1958) 133–48.

[52] E.H. Warmington, *Remains of Old Latin* 3 (Loeb Classical Library, Cambridge, Mass. and London 1938) 476–77, 514–15.

[53] Shekel coins: *ACGC* 287–90; M.J. Price, "The 'Porus' Coinage of Alexander the Great," in *Studia Paulo Naster Oblata* 1 (Orientalia Lovaniensia Analecta 12, Leuven 1982) 76. *As* coins: Sutherland (supra n. 34) 20–26.

[54] O. Ravel, *Les "poulains" de Corinthe* 1 (Basel 1936).

[55] *ACGC* 80–82, pl. 13.220 (Ravel Group I.1), 221, 223 (Group I.2), 222 (Group I.3), 225–26 (Group II).

[56] B.V. Head, *British Museum Catalogue of Greek Coins: Corinth, Colonies of Corinth, Etc.* (London 1889) xviii–xx; *HN*[2] 400. An alternate chronology, which begins Group II ca. 550, was argued by P. Gardner, *A History of Ancient Coinage 700–300 B.C.* (Oxford 1918) 135–36, and adopted by Ravel (supra n. 54) 15–19.

[57] The stater, now in Paris, is illustrated in the Basel sale catalogue 8, 23 Mar. 1937, 302, and was struck from the obverse die Ravel P36, the nineteenth die in Ravel's sequence of 42 Group II.2 obverse dies (P18–P60).

an Athenian Wappenmünze which bore a gorgoneion obverse and which therefore was minted at the very end of the Wappenmünzen sequence, just before the Athenian owl coinage was introduced in the last quarter of the sixth century. Since the Group I.2 Corinthian stater in question was followed by further staters of this group and by the staters of Group I.3, it is certain that the Group I staters were still in production well after 525. The appearance of five Group II staters in the Taranto hoard of ca. 500–490[58] gives a terminus ante quem of ca. 490 for the start of Group II coins with reverse Athena heads; and in light of both termini the start of this group can hardly fall before ca. 515, the date conservatively proposed by Kraay, if it does not in fact belong as late as ca. 500, the time preferred by Price and Waggoner.[59]

On the other hand, the traditional Cypselid dating for the start of Group I is now seen to have been based on at least one false premise. The assumptions were that Corinth must have begun to coin after Aegina but before Athens and that the earliest coinages of these latter states dated respectively in the first half of the seventh century (according to the testimony attributing the first Aeginetan coinage to Pheidon of Argos) and in or before 594 (according to the testimonia regarding Solon's monetary reform at Athens).[60] With the downdating of the earliest Athenian coins to the middle of the sixth century, however, a seventh century date for the start of the earliest coinage at Corinth is, on this reasoning, no longer mandatory.

The only additional argument that has ever been adduced in support of the chronological association with Cypselus is Seltman's comparison between the Pegasi of Group I.1 staters and the Pegasus on a Late Protocorinthian aryballos in Boston of about 650 B.C.[61] But the valid points of comparison are limited to the animals' galloping schema and the typically archaic pattern of their scythe-shaped wings. In a more detailed analysis, Brown observed that the proportions of the Group I.1 Pegasi and the natural leg movements of the Group I.1 Pegasi depicted in a walking pose are not paralleled in the representation of horses on archaic painted pottery until the second quarter of the sixth century and later; Brown concluded that "no reason really exists for placing any [Group I staters] before 575."[62]

Very much the same result is obtained by applying to the known number of Group I obverse dies the principle employed by Kraay for estimating the maximum span of the Athenian Wappenmünzen, namely, that no Greek coinage is likely to have been minted from less than one new obverse die per year.[63] There is nothing arbitrary about this principle, for a number of Greek civic coinages marked with annually changing issue letters, symbols or magistrates' names on their reverses have been studied, and their average consumption of new obverse dies ranges from between 0.8 to 2.2 dies per annum at the low end of the scale up to as many as 9–10 dies per annum.[64] We have shown above that the principle is fully vindicated in the case of the Athenian Wappenmünzen, whose 50-odd known obverse dies[65] were expended in a period of only some 20–30 years.

As Kraay has remarked, the Group I coinage of Corinth was not appreciably more extensive than the Athenian Wappenmünzen.[66] Sixty-five dies are listed in Ravel's 1936 corpus: 17 dies for Group I.1, 42 for Group I.2 and 6 for Group I.3; and, while further dies will doubtless be added to these totals as the corpus is updated, we have no grounds for expecting that these numbers will be augmented significantly. Working backward from the terminal date of ca. 515–500 for the group, the 65 recorded dies give an outside starting date between approximately 580 and

[58] See Table II and supra p. 327. As shown in Table II, the Sambiasi, Mit Rahineh, Demanhur, Sakha and South Anatolian hoards contained Group I but no Group II Corinthian staters, a further indication that Group II does not begin until very late in the sixth century. The fact that Group I (but, again, no Group II) staters were often overstruck by coins of Metapontum belonging to the period after 510 (supra p. 327) points in the same direction. See *ACGC* 81, pl. 13.224; Price and Waggoner 78, 132, n. 106.

[59] *ACGC* 82; Price and Waggoner 78.

[60] Head (supra n. 56) xviii.

[61] C. Seltman, *Greek Coins*[2] (London 1955) 39.

[62] W.L. Brown, "Pheidon's Alleged Aeginetan Coinage," *NC* ser. 6.10 (1950) 187–88, 201–202, ns. 44–48.

[63] Supra p. 331.

[64] E.g., Barron, (supra n. 14) 40–45, 178–79, lists ten obverse dies for the five years of tetradrachm coinage of the Samians at Zancle in the late 490s and (Barron 48, 58–64) twelve obverse dies for the Group VI–VII Samian tetradrachms that spanned fifteen years later in the fifth century. In the sixth, fifth and early fourth century coinage of Abdera, the average number of known tetradrachm (or octadrachm) dies fluctuates from 1.2 to 2.2 per annual issue: May (supra n. 41) 72, 84–85, 144, 178. *ACGC* 19, 84 n. 1, notes the simultaneous use of two obverse stater dies at the mint of Leukas from the late sixth century to the mid-fourth century. The 110 issues of the New Style silver coinage of second and first century B.C. Athens were struck from an average of ten dies per issue, with as many as 30–47 obverse dies being consumed in peak years of minting (M. Thompson, *The New Style Silver Coinage of Athens* [New York 1961] 650–54); if one accepts the revised chronology that dates the coinage from the 170s down to the late 40s B.C. and requires certain gaps in the annual sequence during the early and late periods (O. Picard, *Chalcis et la Confédération Eubéenne* [Bibliothèque des Écoles françaises d'Athènes et de Rome 234, Paris 1979] 198-202; J.H. Kroll, "Two Hoards of First-century B.C. Athenian Bronze Coins," *Deltion* 27 [1972] *Meletai* 93–99), the overall expenditure of recorded obverse tetradrachm dies falls to an annual average of nine.

[65] Supra n. 37.

[66] *ACGC* 80.

565 B.C. If, as is likely, the mint commonly employed more than a single obverse die in certain years, a somewhat later estimate for the beginning of the Group I coinage would of course be called for. And in fact a slightly later and probably more dependable outside calculation of ca. 560 is obtained by counting back from the terminus of ca. 525 afforded by the above-mentioned Group II.2 Wappenmünzen overstrike, which according to Ravel's Corinthian die sequence was preceded by 17 Group I.1 and 18 Group I.2 obverse dies.[67] Kraay has suggested ca. 570–560 as the most probable time for the start of Group I, and Price and Waggoner have proposed a date as late as ca. 550.[68] In any case, a date within or very close (on either side) to the second quarter of the sixth century is assured.

There being no literary testimonia or (aside from Seltman's superficial late Protocorinthian comparison) any other evidence to the contrary, this sixth century chronology should cause no misgivings. The only disagreement is with the beliefs of past scholarship, and here we would point out that the usual assumption that the earliest staters of Corinth necessarily precede the introduction of the Wappenmünzen coinage at Athens is itself open to question. The only sure sequence is that the Corinthian Group I.1 staters with the incuse "Union Jack" reverses must follow the earliest phase of coinage at Aegina in which the "Union Jack" reverse punch originally developed. This in turn raises the question whether Aeginetan coins really did begin in the first half of the seventh century, some 75–100 years before coinage was adopted at Corinth, or whether the chronology of early Aeginetan coinage too should be lowered considerably in order to bring it into a closer and more plausible temporal relationship with the earliest issues of Corinth and Athens.

AEGINA

Our discussion of early Athenian numismatic chronology illustrates the hazards of uncritically regarding ancient testimonia as unimpeachable evidence for the early history of Greek coinage. If fourth century B.C. scholarship, employing good documentary evidence for the reforms of Solon, could be confused about the nature of Athenian currency at the time of these reforms, it was not likely to have been any better informed about monetary matters at the much earlier time of Pheidon of Argos.

According to Strabo (8.6.16 and 8.3.33), the tradition that Pheidon struck the first coinage at Aegina rests on the authority of Ephorus, the fourth century historian whose attributions of famous inventions to famous figures of the dim past were in some instances recognized as anachronistic even by ancient writers.[69] An expanded version of the tradition, found in the fifth century A.C. *Etymologicum* of Orion (s.v. ὀβελός), adds that when Pheidon issued the coins he took in the spits that had served as the previous currency and dedicated them to Argive Hera.[70]

The elements that gave rise to the tradition seem apparent enough: 1) Just as Solon was well known for his metrological reforms at Athens, Pheidon was remembered for "having made standard measures (*metra*) for the Peloponnesians" (Hdt. 6.127). These measures undoubtedly involved measures of capacity, and at least Ephorus—although we have no independent literary or epigraphical evidence to this effect—believed that Pheidon established measures of weight as well.[71] 2) In the Classical period the popularity of Aeginetan coinage in Southern Greece was so widespread that Pollux (9.74) and Hesychius (s.v. χελώνη) refer to it as "Peloponnesian *nomisma*." The primitive appearance of archaic specimens, many of which were still circulating in the fourth century B.C., showed them to be the oldest coins of Greece. And whether or not their weight standard corresponded to any Pheidonian *metra*, it was almost inevitable that someone would have come to associate them with the metrological activities of Pheidon, much as early Athenian coins came to be associated with the weight reform of Solon. Thus, Pheidon received credit for introducing coinage in Greece. 3) A dedication of spits in the Argive Heraeum was known or believed to have been made by Pheidon, and, because (as the entry in Orion's *Etymologicum* empha-

[67] Supra n. 57.

[68] *ACGC* 80; Price and Waggoner 79.

[69] Brown (supra n. 62) 194.

[70] For the relevant texts and extensive discussion of the Pheidon-Aegina tradition, see Brown (supra n. 62) 177–98; Kagan 1960:121–36; *ACGC* 313–15.

[71] *FGrHist* 70, F 115 (*apud* Strabo 8.3.33): **καὶ μέτρα ἐξεῦρα τὰ φειδώνια καλούμενα καὶ σταθμοὺς καὶ νόμισμα κεχαραγμένον τό τε ἄλλο καὶ τὸ ἀργυροῦν.** That "Pheidonian" measures of capacity were known and still employed in some parts of Greece during the fourth century is clear from *Ath. Pol.* 10 (supra n. 7); M.N. Tod, *Greek Historical Inscriptions* 2 (Oxford 1948) no. 140, line 82; and Theophrastus, **Αἰσχροκέρδης** 11. On the other hand, the sources are silent about any specifically "Pheidonian" weights, and the assumption made frequently by modern scholars that the weight standard of Aeginetan coins went back to Pheidon is therefore very much open to question; see J. Beloch, *Griechische Geschichte* 1.2 (Berlin and Leipzig 1926) 347–49; J. Johnston, "Solon's Reform of Weights and Measures," *JHS* 54 (1934) 182–83; Kraay (supra n. 8) 4. Whatever its origin, the weight standard that was eventually known as the Aeginetan standard must have been widely disseminated by the beginning of the sixth century if it was employed at Athens before the reforms of Solon (supra pp. 326–27, 332).

sizes) the basic denominations of silver coins—*obolos*, literally a "spit," and *drachma*, literally a "handful" of spits—obviously derived from the early use of spits as currency, the Heraeum spits were assumed, quite naturally, to relate to Pheidon's introduction of coinage.

This very dedication of iron spits came to light in 1894 in the excavation of the temple of Argive Hera.[72] Leaded together in a large bundle and accompanied by a massive iron bar, the spits must have been a monetary offering of some kind. If they were genuinely dedicated by Pheidon and if their original number or weight conformed to some kind of system,[73] they would lend credence to the notion that Pheidon was involved with weights and currency in addition to measures of capacity. But even so, the more critical notion that Pheidon minted the first Aeginetan coins should still be regarded only with the greatest skepticism since it would have us believe that the ruler of one city-state, no matter how imperialistic his career, would have undertaken to create his new coinage at the mint *and* with the local emblem of another state—a phenomenon, so far as we know, without parallel in monetary history. Whether or not Pheidon actually controlled Aegina,[74] no sophisticated argument is needed to demonstrate that had he struck coins they would have been Argive coins. The tradition of a Pheidonian coinage at Aegina is thus just as hard to credit as historical fact as it is easy to understand as a conjectural reconstruction of a later age, and provides no convincing foundation for the chronology of early Aeginetan coinage.

A more reliable foundation would be the terminus post quem provided by the date of the earlier electrum coinage of Lydia and Ionia, but since current opinions date it from the late seventh century all the way back to ca. 700, the implications for Aegina must wait until a new consensus is reached. Consequently, we are, at present, left to review what can be deduced about archaic Aeginetan chronology from the coinage and hoard contexts alone.

The earliest phase of the coinage, Holloway's "Early Linked Series," which we have chosen to designate as Period i, is in some ways the best understood. It consists of a very small initial issue (two coins extant, both from a single obverse die), whose reverse punches are crisscrossed by random lines reminiscent of the reverses of certain early Ionian electrum coins,[75] and of three small subsequent groups of coins with punches that bear a rough, indeterminate design or are crossed by four lines in the pattern of the Union Jack.[76] It is clear that this earliest coinage of Aegina must have been limited in volume and, however intermittent, relatively short in duration since Holloway, whose study was based on the examination of 1067 archaic Aeginetan staters, was able to isolate only 44 coins from this period, all struck from a mere 15 obverse dies. As Holloway notes, the fairly extensive die repetition among these 44 coins indicates that "we possess a good sampling of the work of a very small mint and that the losses in the earliest die sequence are insignificant."[77]

In contrast, the output of coinage in Period ii was huge, so much so that no estimate of the number of obverse dies is available. This is the period to which nearly all archaic Aeginetan coins belong, and in the course of it the pattern of their reverse punches evolved through several stages. The sequence of patterns is: "Union Jack" (eight sunken triangles, one or more of which are frequently filled in), "Five sunken triangles," "Windmill sail" (four sunken triangles), "Proto-skew" (two triangular and three trapezoidal sunken segments), and "Small skew" (in which the "Proto-skew" arrangement is regularized).[78] Evidence of hoards and obverse die linkage between some patterns indicate a considerable overlapping of the patterns (largely, it would seem, as old reverse dies were continued in use alongside newer ones), so that only three meaningful phases of this period should be distinguished[79]:

Period	iia	"Union Jack," joined by "Five triangles" and "Windmill sail"
	iib	"Five triangles" and "Windmill sail" joined by "Proto-skew"
	iic	"Small skew"

There is a certain ambiguity between late Period iia and early Period iib, but classification here is assisted

[72] C. Waldstein, *The Argive Heraeum* 1 (Boston 1902) 61–63, fig. 31. J.N. Svoronos, "Μαθήματα Νομισματικῆς," *JIAN* 9 (1906) 192–202; P. Courbin, "Le monnayage dans la Grèce archaïque: valeur comparée du fer et de l'argent," *Annales. Economies, sociétés, civilisations* 14 (1959) 209–33; A.E. Furtwängler, "Zur Deutung der Obeloi im Lichte samischer Neufunde," in H.A. Cahn and E. Simon eds., *Tainia: Festschrift für Roland Hampe* (Mainz 1980) 92–98; P. Courbin, "Obéloi d'Argolide et d'ailleurs," in R. Hägg ed., *The Greek Renaissance of the Eighth Century B.C.* (SkrAthens 30, Stockholm 1983) 146–56.

[73] Furtwängler, (supra n. 72) 94, expresses doubts whether the Heraeum spits did in fact conform to a fixed value system.

[74] The evidence is discussed by Kagan, 1960:129–30, who concludes: "The fact is that it cannot be shown with certainty that Pheidon ever ruled Aegina."

[75] Brown (supra n. 62) 182 (Class I), pl. 11.1; Holloway 3, n. 7, pl. 6.2; *ACGC* 44, pl. 6.113.

[76] Holloway 9–13, pls. 7.1–11, 8.1–6.

[77] Holloway 13.

[78] For the patterns, see the catalogue and illustrations in Price and Waggoner 69–73, pls. 19–21. Also *ACGC* 44, pl. 6.114 (Union Jack), 115 (Windmill sail), 116 (Five triangles), 117 (Small skew).

[79] Holloway 5–6; Price and Waggoner 74.

TABLE II: Early Hoards Containing Archaic Coins of Aegina and Corinth

Hoard	*IGCH* No.	Date	Aeginetan Coins by Periods					Corinthian Coins by Groups	
			i	iia	iib	iic	iii	I	II
Persepolis Apadana	1789	517–514		1					
Sambiasi (Italy)	1872	ca. 520						3	
Cyclades	6	late 6th c.	3 (out of total 114 Aeginetan coins)						
Mit Rahineh (Egypt)	1636	ca. 500		1				4	
Demanhur (Egypt)	1637	ca. 500–490		16				6	
Sakha (Egypt)	1639	ca. 500–490		2(+?)				8	
Matala (Crete)	1	ca. 500–490?		68					
Taranto (Italy)	1874	ca. 500–490		15	(1?)			10	5
South Anatolia	1177	ca. 480–475		4	6			1	
Asyut (Egypt)	1644	ca. 475 or later	1	63	53	10		6	33
Isthmia Deposit	11	ca. 475		x	x	x	x	x	x

by the careful study of obverses which reveals that the typical "Thin collar" turtle of Period iia is joined in Period iib by several variant types: the "Heavy collar" turtle, the "Trefoil collar" turtle, and the "Proto-tortoise" with trefoil collar.[80]

The archaic coinage concludes with the introduction of the distinctive "Large skew" issues of Period iii, which have conspicuously enlarged reverse incuse squares, enlarged turtles, and a new T-shaped arrangement of pellets on the spine of the turtles' shells.[81]

The hoard evidence summarized in Table II is unequivocal in dating periods iib and iic between ca. 500 and 480. "Proto-skews" first appear in the South Anatolian hoard of ca. 480–475, but are not present in the Taranto hoard of ca. 500–490. "Small skews" are the latest variety in the Asyut hoard of ca. 475 or later, but since at least one "Large skew" (Period iii) was present in the destruction debris of the archaic temple of Poseidon at Isthmia, a destruction dated by context pottery to ca. 475, the "Large skews" must have begun by the early 470s.[82] The stylistic break between the "Small skew" and "Large skew" coins is therefore almost certainly a result of the Persian presence in Central Greece in 480–479, which inevitably would have caused an interruption in minting.

Three important deductions follow: 1) Period iia is seen to come down at least as late as ca. 500. 2) The

[80] Holloway 7–8; Price and Waggoner 70–76. Hence our Period iia is equivalent to the "Thin collar" group of Holloway (16) and Price and Waggoner (76); our Periods iib–c correspond to Holloway's and Price and Waggoner's "Heavy collar," "Trefoil collar," and late "Proto-tortoise" group.

[81] Holloway 8, pl. 6.4; *ACGC* 46, pl. 6.123.

[82] Holloway 8; *ACGC* 46.

compression of the substantial Period iib and iic coinages within the two opening decades of the fifth century demonstrates that Aeginetan coining at this time was extremely intensive, analogous to the prolific outpouring of Athenian Group IV–VI owls during these same decades. Such concentrated striking is reflected in the overlapping reverse patterns of Period iib, and since the same overlapping occurs throughout all but the earliest, exclusively "Union Jack" phase of Period iia, the conclusion follows that, 3) the bulk of the Period iia coinage was struck no less intensively and so was concentrated in the last decades of the sixth century (if in fact it did not spill over into the fifth).

All these deductions are confirmed by the recently published lead isotype analyses of 44 Aeginetan coins from the Asyut hoard.[83] In this pioneering study, the silver of the seven analyzed "Union Jacks" of Period iia was found to derive from two sources: the mines of Siphnos and an as yet unidentified source, possibly Macedonian. In all later phases of the coinage, beginning with Period iia "Five triangles" and "Windmill sails," however, some of the silver employed came from the Laurion mines of Attica. This silver is not found in Athenian coins until near the end of the Wappenmünzen series, ca. 530–520, and was not produced in optimum quantities until the massive expansion of the (Group IV–VI) owl coinage after ca. 500.[84] Thus, at the least, a substantial part of the Period iia coinage of Aegina must date no earlier than the last quarter of the sixth century.

What little is known about the history of silver exploitation on Siphnos may also have some significance for the chronology of Period iia. Although the Siphnian mines had been worked since the prehistoric era,[85] Herodotus (3.57) informs us that the income from the mines reached its apogee at the time of Polycrates of Samos (532–522 B.C.), when the Siphnians undertook expensive building projects at home and at Delphi and were forced to pay off attacking Samian exiles with 100 talents of silver. Until Laurion silver became available in the last quarter of the sixth century, Siphnos was one of two sources of silver for Aeginetan coinage, but being the closer to Aegina it was presumably the more influential, so that it would be surprising if its exceptional level of silver production in the third quarter of the sixth century was not matched by a corresponding intensity in the volume of coining at Aegina. Such intensity could only fall somewhere in Period iia; inasmuch as the later, heavily concentrated coinage from this period comes down to or through the end of the sixth century, one may doubt whether little, if any, of the rest of the Period iia coinage need date before 550.

There is certainly nothing in the remaining hoard evidence that even hints at an earlier dating, although the evidence here is very slight since none of the Period iia staters from the Demanhur hoard have been published with illustrations and the three Period i staters known from the Cyclades hoard and the two Period iia "Union Jacks" known from the Sakha find were selected from a much larger original total of Aeginetan coins in these hoards for their fine, i.e., relatively unworn, condition.[86] Still, the publication on Demanhur notes that "Mill sails" were conspicuously absent from that hoard,[87] indicating once again that the fully developed phase of Period iia belongs quite late in the sixth century. And there can be no question of modern selection regarding the "Union Jack" excavated with a tetradrachm of Abdera and four light-weight gold Croesids from the foundation deposit of the Apadana of Darius I at Persepolis, buried according to the inscription in the deposit between 517 and 514.[88] The Abderite and Lydian coins were probably quite recently minted at this time,[89] but in any event cannot be dated before 550. Abdera was not founded until 544, and the light-weight Croesids must follow the issues of heavier weight with which Croesus (560–545 B.C.) initiated his gold coinage. It stands to reason that, especially in a royal, ritual burial such as this, the Period iia "Union Jack" ought to be contemporary with these other coins and thus it too was minted in the second half of the century. Beyond this one cannot go, for the Persepolis deposit is the earliest absolutely dated context for any Greek silver coins on record.[90]

[83] Gale, Gentner and Wagner (supra n. 34) 28 (Table 7), 33–43.

[84] For the gradual changeover from non-Attic to Laurion silver in the late Wappenmünzen with wheel and gorgoneion types, see Kroll 13–15; Gale, Gentner and Wagner (supra n. 34) 30–33, 49.

[85] N.H. Gale and Z.A. Stos-Gale, "Cycladic Lead and Silver Metallurgy," *BSA* 76 (1981) 202, 211–17.

[86] Cyclades hoard: Holloway 9–11, pl. 7.1, 6, 10. Sakha find: H. Weber, "On Finds of Archaic Greek Coins in Lower Egypt," *NC* ser. 3.19 (1899) 273, pl. 15.6–7.

[87] H. Dressel and K. Regling, "Ägyptische Funde altgriechischer Münzen," *ZfN* 1927, 55.

[88] The Aeginetan coin (E. Herzfeld, "Achaemenid Coinage and Sasanian Mint-names," in J. Allan, H. Mattingly and E.S.G. Robinson eds., *Transactions of the International Numismatic Congress, London 1936* [London 1938] 414, fig. B = E.F. Schmidt, *Persepolis* II [Chicago 1957] pl. 84.27) is in a good state of preservation, i.e., the pellets running down the turtle's carapace have not been worn away by long circulation.

[89] In his review of May, (supra n. 41) 321, Holloway plausibly argues for a date of ca. 517 for the Abderite coin. Light-weight Croesids continued to be struck after the Persian annexation of Lydia down into the reign of Darius I (*ACGC* 31–32).

[90] The ca. 550–525 date given in *IGCH* for the Matala hoard of 68 Period iia Aeginetan staters derives from T.J. Dunbabin's iden-

It is always possible, of course, that an earlier hoard may some day turn up and, if reliably dated (e.g., by excavation stratigraphy or the style of its ceramic container), may require an earlier date for a Period iia Aeginetan stater. But as a matter of principle, one is obliged to work with the evidence that exists and to assume that, so long as it is consistent, it should be meaningful. On this assumption, the Period iia coinage as a whole does indeed appear to have been an intensively struck and relatively compressed coinage, like the demonstrably compressed Period iib–iic coinage that succeeded it, and may well date in its entirety to the second half of the sixth century. Hence there is considerable justification for the Aeginetan chronology developed by Holloway and Kraay, which places the start of Period iia around 550 and therefore the beginning of Period i, with its 16 known obverse dies, around 580 or 570.[91] Both scholars were admittedly influenced by Robinson's late seventh century dating for the early development of coinage in East Greece and Lydia, but it should be clear that their chronology does not depend on that dating since it is more broadly based on a reasoned assessment of the late sixth century evidence for Period iia.

Against this chronology must be set the difficulties of the traditional chronology that would stretch Aeginetan coinage back into the first half of the seventh century in order to bring it into conjunction with the preferred dating for Pheidon of Argos. As the well studied Period i coinage hardly admits of extension beyond about a quarter of a century and as the later part of Period iia is anchored in the late sixth century, the only phase of the coinage left for expansion is the early, exclusively "Union Jack" part of Period iia, and it in effect would have to be stretched back over something like a century. For a coinage that shows no evolutionary change, such an extremely attenuated chronology is improbable enough; although it cannot at present be formally disproved, it would introduce the further problem of a tremendous gap between the inauguration of coinage at Aegina before 650 and the spread of coinage to nearby Corinth and Athens some 75 to 100 years later. One might be forced to admit such an interval if the chronology itself rested on anything more than an unquestioning acceptance of Ephorus and the tradition that the Aeginetans owed their coinage to the intervention of an alien ruler of Argos. There is, however, no corroborating evidence, and since the historical value of the tradition is itself intrinsically dubious, so must be any chronology derived from it.

Although the outcome of the current discussion over the dating of the earliest electrum coinage of Western Asia Minor will provide a high or low terminus post quem for Period i at Aegina, the terminus can have very little effect on the independent chronological considerations outlined above. A late seventh century date for the electrum coinage would reinforce a sixth century chronology for the beginning of Aeginetan coinage. An early seventh century date would merely create a long interval in the spread of coinage from Ionia to Aegina and require numismatists and historians to rethink their assumption that the spread of coinage was a rapid phenomenon. No matter how long, or short, the interval must allow for the change from coinage in a special and valuable alloy—electrum—to one in pure silver; and this fundamental change alone relates the early silver coins of Aegina much more closely to the sixth century silver coinages of Corinth and Athens than to the electrum coinages of East Greece and Lydia, regardless of when in the seventh century these electrum coinages were first produced.

CONCLUSION

Coinage did not spread widely throughout the Greek world until the second half of the sixth century B.C., to which time the earliest silver coins of South Italy, Sicily, Northern Greece and most Central Greek states belong. Primarily from stylistic considerations, this chronological pattern was correctly recognized in the nineteenth and earlier twentieth centuries by numismatists who nevertheless felt obliged to regard the first silver issues of Aegina, Corinth, Athens and a number of Aegean island states with coinages typologically derived from Aeginetan coins as much earlier exceptions of the seventh century because of the testimonia pertaining to a Pheidonian coinage at Aegina and a Solonian reform of coinage at Athens. The steadily increasing numismatic evidence, however, no longer allows the first coins of Corinth and Athens to be dated earlier than ca. 575 and ca. 550 B.C. respectively and points to a sixth century date for the earliest coinage of Aegina as well.

tification of the container as either "an Attic pot of ca. 525" (Brown [supra n. 62] 186) or "an olpe of the type belonging to the mid-sixth century" (Holloway 3). But the lost pot was known to Dunbabin only through an oral description and so provides no verifiable chronological evidence. With justification Price and Waggoner (19) would date the find from its contents to the time of the Taranto hoard, ca. 500–490.

[91] Holloway 13–16, who suggests that the prolific Period ii coinage may be an indirect consequence of the increased commercial importance of Aegina after the Aeginetans were granted a trade concession at Naucratis around the middle of the sixth century. *ACGC* 43, 354, *ad* no. 113.

These lowered dates for Aegina and Athens run counter to opinions held by historians in the fourth century B.C. But as one sees immediately from Pollux's (9.83) list of the alleged inventors of coinage, which includes Pheidon, Demodice of Cyme (the wife of King Midas), the Athenians Erichthonius and Lycus, the Lydians, and the Naxians, ancient views on the early history of coinage were highly speculative. None therefore should be advanced as primary chronological evidence without the independent empirical support of the full range of available numismatic documentation.

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