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Apostolos L. Pierris

The Origin of Coinage

Nature, Function and Value of Money in Archaic Greece

A West Anatolian weight-system seems to have centered round a mina of about 444 gr. (talent ~ 26.622 gr.) from the Bronze Age onwards. V. Karwiese p. 83 (also p. 85 including weights of noble metal objects). Maybe that was a sea-standard, for it appears to be confirmed by characteristic weights found in a large area including Cyprus, Crete, Euboea, Egypt, Anatolia, even atypically Iran. Cf. Karwiese p. 102 (nuggets) and p. 103 (Hacksilber). The (seventeen) copper oxide ingots discovered in the sea off Euboean Cyme and the one from the Palace of Mycenae (Seltman pp. 1 sqq.; pp. 113-4) point in the same direction, with a talent from 23.625 to 27.720 gr. averaging 25220 gr. (A sixth century bronze lion in Abydos, bearing an inscription in Aramaic "correct in accordance with the silver-staters" scales 25675 gr.). What has been taken as one quarter-talent and three half-talent ingots are graduatedly underweight, corresponding to talents of 21400, 18900, 20160, 22680 respectively. They may represent approximations to $\frac{3}{4}$ of the standard. A Knossos palace tablet bears pictographs of an ingot followed by six horizontal dashes arranged in two columns, followed by a balance followed by five similar dashes and some signs that have been interpreted as $2\frac{1}{2}$ (Seltman p. 2). Evans (taking the scales as signifying talents) interpreted the text as stating the value equivalence of 60 bronze ingots to $52\frac{1}{2}$ units of the gold standard, the small gold talents of Homer (c. 8.5 gr.). Given the weight-based value-system of even monetized economies in the ancient world, we should better explain the tablet as stating the *weight-equivalence* of two different systems, the second one a basic weighing standard as there is missing any indication of what is the object weighed against the ingots. Remarkably, comparing the ingot standard to the (light)

Babylonian one, we get $\frac{30000}{26000} = 1.15 \cong 1.14 = \frac{60}{52\frac{1}{2}}$. A maritime trade standard

and an inland Babylonian one seems thus to be attested for the Bronze Age World. Evidence from Sardenia also would seem to corroborate this existence of a commercial maritime-nations weight standard-stater of ca. 14.8 gr. Caution is surely needed when one scans such vast areas of space and time and works with

such approximations. On the other hand a close knit trade system in (Eastern) Mediterranean even at very early dates should not come as a surprise, but to one committed to strong primitivist orthodoxy.

Anyway when the Lydians and Ionians started to coin money, they took over such a weighing standard for their electrum emissions. Series I (Karwiese p. 135) suggests a stater of 14.1 gr., or 95.3% of the weight standard, i.e. almost 5% less than it, similarly to the Solonian arrangement.

The choice of Electrum as monetary material surely allowed for the appreciation of the value of the noble metal as a result of its monetization (its financial function). The composition in gold of even the first emissions was artificially lowered from the level that naturally obtains. Thus in Pactolus we meet with a $80 \pm 6\%$ presence of gold (Keyser and Clark table 7.1 p. 107), ancient artifacts from Troy give a 75 to 96%, and from Lydia 93% (Table 7.2 p. 109), whereas extant analyses of early Electrum coins ascribe to them a gold content of 46-60% (Lydia VII century, Table 7.3 p. 111) or 30-77% ("Ionia" VII century *ibid.*). For two "Alyattes" thirds different methods of analysis gave values from 44.6 to 50.9% for the one and 55.6 to 64.7% for the other (Table 7.4 p. 114). We shall encounter similar facts about the Phocaeian and Mitylenaeian currency in a moment.

Assuming a $13 \frac{1}{3}$ to 1 Ag to Au relationship in weight for the same value; and also a 10 to 1 Ag to Electrum ratio; we observe that a 14.1 gr. Electrum stater on the LydoMilesian standard is initially equivalent to 141 gr. of Ag and 10.575 gr. of Au. But this later quantity closely corresponds to a weight of 10.33 gr. earlier (or 10.52 gr. later) representing the $\frac{1}{48}$ of the Babylonian mna of c. 496 gr. (c. 505 gr.), or a Babylonian weight talent 29,720 gr. (30300). [The older and newer values for the Babylonian mna are taken from Brandis. McDonald (The Origins of Metrology p. 45) gives 491 to 502.5 gr.].

The Electrum currency, based on the maritime system, was brought into connection with the weight standard obtaining in the Middle Eastern hinterland, and with the practices of noble metal barter existing for centuries in that area. One

LM Electrum coin stater could stand for a weight stater of gold on the Babylonian system (14.1 gr. EL for 10.575 gr. AU).

The crucial point is, however, that for the value relationship $13 \frac{1}{3} : 10 : 1$ to obtain in the case of the new currency, the gold content of its Electrum substance should be at 72.97% ($x\% \text{ AV} \rightarrow 13 \frac{1}{3} \frac{14.1x}{100} + \frac{14.1(100 - x)}{100} = 10(14.1)$, and $x = 72.97\%$). With a 50-50% bimetallic content, the value of the Electrum coin is $13 \frac{1}{3} \frac{14.1}{2} + \frac{14.1}{2} = 101.05$ gr. instead of the required 141; we thus have a mere $71 \frac{2}{3}\%$ of the bullion value. The $28 \frac{1}{3}\%$ appreciation is due to the new monetary function of the metallic content. The actual observed variation in the composition of the coins is also explicable: *it simply does not matter much*. It is not an indication of carelessness – or of fraud. *The very size of the appreciation bespeaks of the enormous success of the new invention, and of its vast utility. Its effects must have been sweeping, propelling societies one after another in rapid succession to a great leap forward. Nobody would look behind and practice immediately obsoletized practices of economic transaction, once the new instrument was conceived and realized and the integral of money achieved.* The only meaningful question is whether this reduction in the gold content in fact more or less offset the appreciation of the money commodity resulting upon its monetary function or in effect did not work through the active value of money. One may speculate pro and contra, but I would think that at the beginning, because of the wondrous efficacy of the spectacular new instrument, the value of money was significantly raised. Without any implication of fraud, this would nonetheless mean that a handsome revenue accrued to the issuing State. While a general depression of prices should be expected. This latter expectation seems to be consistent with reports of low prices at Solon's time (Plutarch, *Solon*, XXIII, perhaps going back to Demetrius of Phalerum himself, in which case the $\nu\bar{\nu}\nu$ relative to which time Solonian prices are cheap refers to late 4th century). To such a combination of high value with low content appear also to point characterisations of Phocaeen emissions as $\kappa\acute{\alpha}\kappa\iota\sigma\tau\omicron\nu \chi\rho\upsilon\sigma\acute{\iota}\omicron\nu$ (Hesychius). However that might

have been the case, it is clear that (given the normally free and open nature of the ancient economy) once the initial shocking experience was absorbed, the monetary handling was directed at stability of the value of money and prices.

The LM standard had a working relationship with the Pheidonian – Aeginetan one. This latter was the third major ponderal and numismatic system to exist in the Greek world – one developed independently from the other two in Greek mainland, esp. in Peloponnesus, the Dorian citadel. The Doric (D) system emerged from iron (silver) equivalences, not from copper (gold) ones. The weight relationship between the two respective standards stands at $\frac{14.15}{12.1} = 1.16 \cong \frac{7}{6}$.

With Electrum staters in LM and silver ones in D, the value equation becomes 6 LM EL staters = 70D (AEG) AG staters.

The Euboic system seems to have developed so as to be compatible with, and a common ground of, the two major competing systems in the Levantine (Near and Middle East) trade, the LM and the Babylonian. With a stater of 17.2 gr., it yields a talent of 30.960 gr. (about the Babylonian light standard) if the LM fractional structure is kept (a talent of 1800 staters and of 60 mnae). On the other hand, by introducing the light-heavy principle of ponderation within the system (as against establishing two sub-systems as with the Babylonian case), we can come up (starting from the same stater) with the LM talent of about 25.785 grs. The talent has still 60 mnae, but the mna consists now of 25 staters instead of 30 (thus weighing $25 \times 17.2 = 429.75$ gr., just in fact the same as the Solonian one). Thus we get the 30 to 25 approximate relationship between the (light) Babylonian and the LM standards. In effect the normal number of 1800 Euboic staters makes up the (light) Babylonian talent, while the deviant number of 1500 staters constitutes the proper Euboic talent, equal to the LM talent. This double compatibility is being effected by introducing within the weighing system a division into 100 instead of the normal 60 (light) and 120 (heavy) ones. The fact is made clear once we move into the Attic pattern with double drachmas staters instead of the Euboic or

Corinthian mode of staters divided into thirds. The 100-division of the mna lies also between the light and the heavy standards.

[Herodotus III, 89 sqq. report about the Δαρείου φόρος postulates a 78 to 60 ratio between Babylonian and Euboic talents. This is so because he reckons as Babylonian silver talent not the old one but that which corresponds to the Persian Empire coinage. The Persian silver siglos weighed originally 5.35 gr. (raised during the course of the 5th century to 5.55 gr.). Taking the 5.55 gr. norm for Herodotus' times, we get a talent of $5.55 \times 6000 = 33300$ gr. which stands to the Euboic talent of, say, 25675 gr. (the Abydos lion) in the relationship 1.3, exactly the figure of Herodotus (after the correction in the text) $\frac{78}{60} = 1.3$. Taking the Herodotean Babylonian silver talent as a monetary weight, we have to assume difficulties in the circulation of the Imperial silver coinage, as it had to be overweight in order to complete with the dominant Greek currencies in the markets.]

A different fractional system with the same basic unit (stater) provides simultaneous compatibilities with the two dominant weight systems in the Levant, the maritime and the land norm. In terms of the currencies involved, 10 Euboic staters weighed as much as about 14 Aeginetan ($\frac{17.2}{12.2} = 1.409$). But on the other hand there was an uneasy relationship between the Euboic and the LM currency ($\frac{17.2}{14.1} = 1.22 = \frac{61}{50} \cong \frac{60}{49}$) : something like 49 Euboic silver staters would roughly correspond to 6 LM EL staters. However, this is merely indicative, as we cannot judge about currency exchange with reference to their metallic content alone and with only speculative exactness in the norms involved.

The Phocaeen EL currency shifted the emphasis to the Euboic system. Its stater (when stabilized in Series I) weighed about 15.48 gr. which related to the 17.2 Euboic standard with great exactness as 9 to 10. Hence 9 PH EL staters were meant as equivalent of 100 EU AG staters. On the other hand, the Phocaeen-Aeginetan connection is rendered now precarious: $\frac{15.48}{12.2} = 1.269$. (Roughly 4 Phocaeen staters correspond to 50 Aeginetan silver ones). Initially (before 520/500 BC) the standard

was higher, between 15.73 (average) and 16.07 (if we exclude two atypically low weighed pieces corresponding to a stater of 14.4 and 14.01 gr. respectively). The Euboic relation is then $\frac{17.2}{15.73} = 1.093 \cong 1.099 = \frac{100}{91} \left[\frac{17.2}{16.07} = 1.07 \cong 1.075 = \frac{100}{93} \right]$. The Aeginetan $\frac{15.73}{12.2} = 1.29 \cong \frac{13}{10} \left[\frac{16.07}{12.2} = 1.317 \right]$. Again the Euboic relationship is more stable, the Aeginetan precarious. One should be careful not to draw any definite conclusions from such calculations. Besides the uncertainty of the norm if not corroborated by some specific ponderal system, there is the systematic discrepancy between value of the currency and the weigh of its metallic content that should be always kept in mind.

Phocaeen (in its first stabilization) to LM stands as $\frac{15.48}{14.15} = 1.094 \simeq 1.091 \simeq \frac{12}{11}$. It is difficult to explain the adoption of such a standard of emissions, esp. as it does not seem to correspond to any recognizable differing ponderal system. With the same sexagesimal fractional system, it corresponds to a heavier Euboic talent of $15.48 \times 1800 = 27864$ gr. Early Phocaeen coinage apparently predates 620 BC. Thus it followed in relatively close order upon the LM emissions. I would suggest that this raising of the metallic content was a means of capturing a significant position in the markets in competition to the dominating LM currency; and that the actual market value of the coins was effectively much the same, 12 Phocaeen staters equalling 12 LM EL staters. *In fact there takes place in the sequel a gradual lowering of the Phocaeen standard just as there is a gradual reduction in the gold composition of its metallic content.* (Data from Friedrich Bodenstedt, *Die Elektronmünzen von Phokaia und Mytilene*, and *id.*, *Phokäisher Elctron-Geld von 600-326 v.Chr.*).

Time	Series	Emission Period	Average weight of stater (reduction from the sixths)	Gold composition %
Before 625/600	E	-	15.73 (16.07)*	-
625/600 – 522	1	I	15.44	53.8
521 – 478	2	II	15.33	45.7
(477-388) 477-456	3/1	III	15.162	477-438 39.6

454 – 428	3/2	"	437-398	15.162	437-398	"
426 – 388	3/3	"	397-388	15.168	397-388	41.4
387 – 326	4	"		15.234	387-326	"

* This is the early average if we except two aberrantly low weight coins.

Similarly for the Mitylenaen coinage:

Before 522	E	-	14.78	(15.4)**	-
521-478	1	II	15.138		43.9
477-455	2	III	15.042		477-455 39.6
454-427	3	"	15.042		454-443
412-378	4	"	15.126		442-432
377-326	5	"	15.24		431-428 40.5
					412-398
					397-378

** Again excepted are in this average two abnormally low weight coins.

The corresponding figures for the Kyzikenes are:

600-525	I + II a	v. Fritze	15.888	52
525-410	II b + III		15.984	51

There is a tendency to lower weight standard in the Phocaeen and Mytilenean emissions. In fact the few existing staters (all very early) are markedly overweight, over 16 gr. (16.450 two early Phocaeen, and 16.34 one early Mytilenaean). Among the numerous sixths (and the other fractions) there is often violent variation, esp. in early coins. It didn't greatly matter, as the monetary function of the stamped metal pieces took over their inherent specific utility and valuation. There is no question of fraud being practiced on the part of the State Mint against the citizens. A strict legislation enacted capital punishment for the Director of the Mint in case of any adulteration of the monetary standard as set (v. the Coinage Treaty between Mytilene and Phocaea). *Besides, how could a state "deceive" a free international market, even if it could defraud its citizens, in that golden era of a totally unregulated, and therefore naturally orderly, international trade?* The official reductions in the standard offset a tendency of appreciation in the value of money

resulting upon an intensifying economic activity. *In effect, the reductions increased the quantity of money circulating, and this augmented liquidity counteracted the deflationary pressure of a bursting economy with inadequate monetary basis.* The ancient monetary authorities acted thus on the wisest rule of monetary wisdom: *keep track of the quantity of money relative to the growth of real economic activity and everything else (including, crucially, interest rates) will look after itself. In particular, stability of prices is automatically ensured. Those reductions (and parallel measures like the differentiation of monetary and ponderal standards) therefore represent policies of stabilization of prices (and of the value of money primarily), which bespeak a modern degree of monetary sophistication – or should I say, a postmodern achievement, as modernity in art, thought as well as in economy, succumbed to the superficial clevernesses of arbitrary manouvering and artificial order.*

There is a similar reduction in the weight norm of the LM emissions. Series II (Karwiese) tends to focus around 13.92 gr., while Series III sets still lower at ~13.5 gr. (for the EL group). Noticeable is that the “silver” coins in Series II are not distinguishable ponderably from the Electrum coins. They also contain not insignificant amounts of gold (5%, 14%, 24.9%). They are probably meant as Electrum coins. The series is Pre-Croisean. In Series III we observe a clear ponderal distinction between the EL pieces which continue to be struck on the LM standard and the silver coins that represent the Croisean currency reform, i.e. the abandonment of the Electrum coinage and the adoption of an official bimetallism with separate currency in gold and silver (Karwiese’s chronology needs revision upwards).

The dates of the reformations in Phocaeen emissions are also significant. The first period ends on c. 522, just with the death of Polycrates of Samos. Then the Samian “thalassocracy” is ended and the Aegean archipelagos is again left without any dominant power. (The Sparta, Naxos, Eretria, Aegina thalassocracies, following each other quickly, as reported by the ancient historiographic traditions, signify precisely that absence of a prevailing power). The Phocaeen thalassocracy is ascribed by those sources to 577-533 B.C., just before the Samian one. In any case,

the collapse of Samian power (signaled by the destruction of the Samian navy in Kydonia by Aegina and the Cretans in 518) permitted the Phocaeans to expand anew their commercial and financial activities, as this was registered by a wider circulation of their Phocaean currency, which caused an appreciation of its value balanced by a reduction of its gold content (and a reduction of its weight norm of less significance).

Similar considerations may explain the other observed revision of the Phocaean-Mytilenaeon currency, the one in 477. With the repulsion of the Persian attack on the Greek states, and as Athens started on her road to hegemony by organizing and presiding over the first Sea League, the Aegean was integrated as an economic space by Athenian might. A bright period of strong economic development ensued, and heavy demand for good, international money. It is not unlikely furthermore (as Bodenstein suggested), that the Phocaean/Mytilenaeon, Cyzicean and Lampsacene Electrum currencies were playing the role of reserve money in the League (and then Athenian) treasury. They were well adapted to perform such a function, as their intrinsic bimetallism also provided the linkage between the Asian inland gold-based currency and the Mediterranean system of concurrent silver currencies.

The ancient accounts of the origin of the Aeginetan coinage connect it with Pheidon, the Argive strongman (an early "tyrant"), whose era is located by Ephor around the middle of the 8th century. (Heracleides Ponticus also explicitly countenanced the connection which may therefore represent Peripatetic perception). The Marmor Parium further testifies to it, raising however the Pheidonian epoch to the beginning of the 9th century, maybe in substituting the Argive Pheidon to the Spartan Lycurgus (but see Jacoby's idea p. 160 to reverse the order of epochs 30 and 31 in the MP, thus bringing it in agreement with Ephorus). The difficulties with Herodotus' lowering of the Pheidonian age (end of 7th century) are well known. Probably the best solution of this intricate nexus is to separate chronologically the two events: Pheidon, very likely in 8th century, codified the

existing mainland Greek-Doric-Peloponnesian system of weights and measures. This gave the “Aeginetan” standard, on which the Aeginetans actually stuck their currency, perhaps more than a century later in the second half of the 7th century. Ephorus’ reason why in Aegina, sounds correct: ἐμπόριον γὰρ γενέσθαι (sc. τὴν Αἴγινα) διὰ τὴν λυπρότητα τῆς χώρας τῶν ἀνθρώπων θαλαττουργούντων ἐμπορικῶς, ἀφ’ οὗ τὸν ρῶπον Αἰγιναιάν ἐμπολήν λέγεσθαι. Aristotle, probably in the same connection, mentioned a characteristic figure: the number of slaves, evidently at the period of Aegina’s acme, 470.000, an incredible figure (Rose Fr. 472) even for a “modernist”! Aristotle further confirms the usual account of the iron derivation of silver Aeginetan money (the obolos-spit, δραξ – δραχμή theory).

This iron-derivation may lead us to suppose that Pheidon also typified bars of iron as means of exchange, thus really establishing proto-money. We may be tempted to ascribe to him reports about a reputed Lycurgan establishment of iron Spartan money (Plutarch, *Apophthegmata Laconica*, 3). The iron was rendered useless by cooling in vinegar or some other way which made it brittle. A twofold result followed: it could be used by cutting off from it smaller pieces in exchange, while its monetary function, distinct from any specific material utility, was emphasized. This Spartan proto-coinage was apparently weighing one Aeginetan mna, i.e. c. 366 gr., corresponding in value to 4 chalkoi (Plutarch, *Apophthegm. Lac.* 8) Aeginetan, i.e. ½ obol. It must have been of the shape of a cake in Sparta, for its name there was πέλανος (= πελανός) (Hesychius s.v. v. Wrongly the scholia ad *Nicandri Alexiph.* give to this πελανός the weight of 1 obol). One obol was generally a spit, more than 1.20 m in length, presumably weighing $2 \times 366 = 732$ gr., a weight stater. The silver/iron ratio upon this reckoning would have been 366 gr. FE to $\frac{1}{12} \times 6.1 = 0.508$ gr. AG or 720.47. A weight stater of iron (2 mnae) had originally the value of one obol of silver ($\frac{1}{6}$ of a drachm) according to the same weight system. Upon this the Aeginetans struck their proper silver coinage. The Aeginetan-Pheidonian system was in all likelihood sexagesimal, with fractionality 60-60-6. It is the Euboic system that introduced decadic divisions, for the reasons above explained.

[For instance, Pollux IX, 85-6, reports that the Aeginetan talent was equivalent to 10.000 Attic drachms. He gives also the equivalence of the Babylonian talent to 7.000 Attic drachms, which is accurate, $7.000 \times 4.3 = 30.100$ gr. For the Aeginetan, the equation works to an Aeginetan unit (in the pure sexagesimal system) of $\frac{10.000 \times 4.3}{3600} = 11.94$ gr., that is close to the normal Aeginetan stater of 12.2 gr. (The slight reduction in weight may indicate, here, too, a corresponding appreciation in the value of money). Of course, he should have said 5.000 Attic drachms, as the Aeginetan drachm is half that amount, but probably he “invents” a heavy (double) Aeginetan standard to account for a heavier than the Attic Aeginetan norm. (We will see that this apply to the respective units, but not to the higher denominations). Also mistaken is Pollux’ statement that everywhere a mna amounted to one hundred corresponding drachms. This would make an Aeginetan drachm of $\frac{10.000 \times 4.3}{6.000} = 7.17$ gr., wide off the mark for the Aeginetan system, and in fact close to the LM standard-stater of 14.1 gr. From the same mistaken principle would stem his equation of one Aeginetan drachm to 10 Attic obols = $\frac{4.3}{6} \times 10 = 7.17$ gr. In fact an Aeginetan drachm was equivalent to about 8.5 Attic obols.

There is another awkward equivalence reported by Pollux which can be satisfactorily interpreted according to our theory. In the section on Static (Στατική) in IV, 171-5, he adduces Aristotle’s testimony that ἡ δὲ λίτρα (the Sicilian one) δύναται ὀβολὸν Αἰγιναιῶν and that the Corinthian stater was called δεκάλιτρον, ὅτι δέκα ὀβολοὺς δύναται. But the Corinthian monetary standard is 8.6 gr. (a tridrachm stater), while 10 Aeginetan obols weight $10 \times \frac{6.1}{6} = 10.17$ gr. The Corinthian stater is actually about 8.5 Aeginetan obols in weight. However, we might have here to reckon with different standards at different times. The Sicilian monetary litra seems to have been *progressively* reduced during the fifth century. And an explanation of this fact may reside in the tendency to progressive appreciation in the value of money, as in the Phocaeen case. In fact, pre-500 B.C. Sicilian coinage operated with a unit (obol or litra) of about 0.86 gr. = $\frac{1}{10}$ of the

Corinthian stater. That produced pieces of 5, 10, 20 litrae (4.3 gr., 8.6 gr., 17.2 gr.), which equaled an Attic drachm, Attic didrachm (= Corinthian stater) and tetradrachm (= Euboic stater). But earlier we meet a standard of about 5.68 to 5.82 gr. This calls for a multiple of 6, e.g. $0.86 \times 6 = 5.16$. It started higher, just under the Aeginetan norm, $1.017 \times 6 = 6.1$ gr. And it went down to $0.86 \times 6 = 5.16$ (coin of 5.12 gr. from Zankle). The heaviest litra weight known (from Lipara) weighs 106 gr. (Kraay). [Litra, like stater, had the systematic ambiguity between the monetary (double) unit and the mna (or double-mna) weight standard]. It could correspond to a unit litra of $\frac{106}{10} = 1.06$ gr., slightly heavier than the Aeginetan norm. Aristotle might have referred to these different stages of the early development.

The oldest existing weights from Athens (three bronze pieces securely located in a pre-500 B.C. period) point to a sexagesimal Aeginetan system. BW1 (Lang and Crosby) bears the inscription $\sigma\alpha\tau\acute{\epsilon}\rho / \delta\epsilon\mu\acute{o}\sigma\iota\omicron\nu \text{ Ἀθ}\epsilon\nu\alpha\acute{\iota}\omicron\nu$ and weighs 795 gr. This is the Aeginetan double mna (stater) of 732 gr. overweight, rather than the Attic commercial double mna of $2 \times 451.5 = 903$ gr. underweight. BW2 has the inscription $\tau\epsilon\tau\alpha\rho\tau\epsilon(\mu\acute{o}\rho\iota\omicron\nu) / \delta\epsilon\mu\acute{o}\sigma\iota\omicron\nu \text{ Ἀθ}\epsilon\nu\alpha\acute{\iota}\omicron\nu$, and weighs 190 gr. which gives a stater of 760 gr. Similarly BW3 is inscribed by $\eta\epsilon\mu\acute{\iota}\tau\rho\iota\tau\omicron\nu / \delta\epsilon\mu\acute{o}\sigma\iota\omicron\nu \text{ Ἀθ}\epsilon\nu\alpha\acute{\iota}\omicron\nu$ and weighs 126 gr., i.e. a stater of 756 gr. All three represent commercial Aeginetan weights whose deviation from the monetary standard may be not accidental, but reflect the same principle that made Solon create a higher commercial standard over the monetary one. In such a case the difference in the norm of these weights themselves, may result from different values of money in differing periods. The lower norm is about 4% overweight relative to the monetary standard, a figure similar to the initial Solonian arrangement.]

Aristotle's account of the Solonian regulation of the Athenian metric system is famously controversial. In the light of this theory of the nature of the coinage revolution and of the data regarding the then obtaining weight systems analyzed above, one may reconstruct Aristotle's meaning as follows.

First, the capacity measures increased relative to the Pheidonian ones.

Second, the *monetary* standard was changed (καὶ ἡ μνᾶ πρότερον ἔχουσα σταθμὸν ἑβδομήντα δραχμάς, ἀνεπληρώθη ταῖς τριάκοντα. ἦν δ' ὁ ἀρχαῖος χαρακτήρ διδραχμον). From an Aeginetan didrachm of 12.2 gr. the Athenians switched to a didrachm of 8.6 gr., as basic unit. However, in place of the Aeginetan mna of $6.1 \times 60 = 366$ gr. (and the talent of 21,96 kg), one got an Attic mna of $4.3 \times 100 = 430$ gr. (and the Euboic talent of 25,8 kg). The reduction in the unit norm was accompanied by the adoption of the Euboic fractional system. The mna had 100 instead of 60 unit drachms. So the standard for the monetary mna was actually raised even though the unit weight was lowered. The αὔξησις τοῦ νομίσματος was also furthermore numerical. Since $\frac{4.3}{6.1} = \frac{100}{141.86} = \frac{70.49}{100}$, 100 Solonian Attic dr. $\simeq 70$ Aeg. dr. The *πρότερον* in Aristotle's text might suggest that the Euboic system was already in commercial use in Attica before Solon, juxtaposed to the Aeginetan monetary standard. Historical reasons may be invoked for such a state of affairs. The fierce antagonism between Athens and Aegina (as reported for the early times by Herodotus) would have made Athens to enter into the Euboic trade connection; while the strong Aeginetan currency will have persisted for some time irrespectively. But such a hypothesis is not favoured by the existence of Archaic Athenian official weights in the Aeginetan standard. This points to a period of resumed commercial connections between Athens and Aegina, even in the Peisistratid era. The Euboic mna of 430 gr. had a weight of 70 Aeginetan drachms before the Solonian reform; 100 new Attic drachms after. The didrachm was retained as the basic monetary unit. The currency equivalences would then be: 35 Aeginetan staters = 50 Corinthian staters = 25 Euboic staters = 50 Attic didrachms = 3 LM EL staters = $\frac{9}{4} = 2\frac{1}{4}$ PH EL staters (=2 staters, a sixth and a twelfth). Or 100 EU staters = 200 Attic didrachms = 200 Corinthian staters = 12 LM EL staters = 9 PH EL staters = 140 Aeginetan didrachms.

Third, the monetary reform was accompanied by a *raise in the weight standard* of $5\% = \frac{3}{60}$. The new commercial mna weighed 451.5 gr., the talent 27.090 gr., the

weight stater 9.03 gr. (in place of the monetary didrachm of 8.6 gr.). 3 Aeginetan drachms would weigh now about a commercial Attic stater; $3 \times 6.1 = 18.3 \approx 18.06$. The reason of this increase was the appreciation of silver as a result of its monetary function. *Now that the Electrum with its vague bimetalism could not provide the solution of the adjustment of the value of money to the market demand and supply conditions for its use, such adjustment would be expressed as difference between weight and monetary standards, given that the monetary denominations persisted in being ponderal ones.*

This is, I think, a neat resolution of the complicated nexus.

Androtion's account (as reported by Plutarch, *Solon*, 15), can be construed congruently. I propose to read (in a clearly corrupt text): ...καὶ τὴν ἄμα τούτῳ (sc. reduction in interest rates) γενομένην τῶν τε μέτρων ἐπαύξησιν καὶ <τῆς> τοῦ νομίσματος τιμῆς (with Sintenis, pro τιμῆν). ἑκατὸν γὰρ ἐποίησε δραχμῶν τὴν μνᾶν πρότερον ἑβδομήκοντ' ἄγουσαν (Th. Reinach's correction of ἑβδομήκοντα τριῶν οὔσαν = ΕΒΔΟΜΗΚΟΝΤΑΓΟΥΣΑΝ) etc. τιμῆς is the appropriate word (not weight), as there was at the time an appreciation of the monetary unit, probably to a higher level than the 5% officially registered in the differentiation between monetary and commercial standards of weight. This greater appreciation mitigated to a certain degree the reduction of the weight standard of the monetary unit, in so far as the repayment of the creditors was concerned. This may partly justify Androtion's hyperbole, that μηδὲν δὲ βλάπτεσθαι τοὺς κομιζομένους through the Solonian reform. *Prices (as a result of these complicated arrangements in the given circumstances) may be expected to have remained more or less stable. In fact the stability (in the value of money) of a natural system is an inherent characteristic of it: it possesses mechanisms of automatic self-adjustment. In this case, high demand for money may have balanced out the reduction in the monetary standard. If we associate Solon's monetary reforms with his measures aimed at economic expansion, the suggestion becomes plausible.* (Cf. Solon F 56 = Plut. Sol. 22: ὁρῶν δὲ τὸ μὲν ἄστῳ πιμπλάμενον ἀνθρώπων ἀεὶ συρεόντων πανταχόθεν ἐπ' ἀδείας εἰς τὴν Ἀττικὴν, τὰ δὲ πλεῖστα τῆς χώρας ἀγεννῆ καὶ φαῦλα, τοὺς δὲ χρωμένους τῇ θαλάττῃ μηδὲν εἰωθότας εἰσάγειν τοῖς μηδὲν ἔχουσιν ἀντιδοῦναι, πρὸς τὰς τέχνας ἔτρεψε τοὺς πολίτας etc. Cf. F65: no export

of natural produce excepting oil. Cf. F75 = Plut. *Sol.* 24: ...ὁ τῶν δημοποιήτων νόμος, ὅτι γενέσθαι πολίτας οὐ δίδωσι πλὴν τοῖς φεύγουσιν ἀειφυγία τῶν ἑαυτῶν ἢ παντοίοις Ἀθήνιζε μετοικιζομένοις ἐπὶ τέχνη. Freedom of enterprise and of contractual arrangements; F76a: ἐὰν δὲ δῆμος ἢ φράτορες ἢ ὀργεῶνες ἢ γεννηῆται ἢ σύσσιτοι ἢ ὁμόταφοι ἢ θιασῶται ἢ ἐπὶ λείαν οἰχόμενοι ἢ εἰς ἐμπορίαν ὅτι ἂν τούτων διαθῶναι πρὸς ἀλλήλους, κύριον εἶναι, ἐὰν μὴ ἀπαγορεύσῃ δημόσια γράμματα).

The evidence of the extant Athenian weights points also in support of this theory. Their distribution (pp. 15-16; included are Agora weights with 352 weights from Pernice) establishes that the Solonian commercial standard must have persisted for long (an 105 monetary drachmae stater \simeq 915.6 gr.). *The frequency of other values being practically spread more or less homogeneously, the increase in the standard which it postulates may best be interpreted as a secular process.* That means that we have a tendency to an overall appreciation in the value of money, which was countered by increases in the commercial weight standard. The significance in this respect of the decree 1013 emerges thus plainly: *it was a regulative measure to stabilize the value of money (and prices).*

The existence of the proposed systematic differentiation between monetary and commercial weighing standards may further explain a number of phenomena that are often either distorted or misinterpreted for lack of an adequate general theoretical hypothesis. Among such facts are (usefully grouped together by Alain Bresson, *Unités de pesée et poids des offrandes dans les sanctuaires Grecs*):

1) Weighing πρὸς ἀργύριον in Attic documents, Delian inventories and literary sources and papyri.

2) The deficit of the effective weight of (precious metal) offerings relative to their nominal weight expressed or understood.

3) Indications like ἀνεπίγραφος ὀλκῆς καὶ νομίσματος in the inventories at Didyma.

4) The Delphic ἀπουσία.

To which should be added:

5) The frequent significant divergence of the active relationship between currencies from their nominal correspondence according to their respective metallic content. (Explaining this by currency exchange commissions clearly will not do). The point is the actual rate of exchange of various currencies in the international money market. Many currencies were practically worthless (οὐ χρήσιμα as Xenophon meaningfully puts it). The Athenian, on the contrary, coinage was valuable, being resold abroad at a premium (*Πόροι*, IV 2).

According to the unanimous report of the ancients, full money existed in Athens before Solon. Probably it was introduced, or widely circulated and adopted as universal means of exchange and credit, between Draco and Solon, i.e. in the last third of 7th century. (In the Laws of Draco penalties seem to have been specified with reference to ox as unit of value, e.g. ἀποτίνειν εἰκοσάβοιον, Pollux IX, 61 = F10 Ruschenbusch). By contrast, in the Solonian legislation there is ubiquitous presence of proper monetary terminology. The fact that monetary denominations are ponderal determinations should not mislead us given the nature of the ancient monetary system. These denominations represent *counting* as well as *weighing*: τὸ γὰρ ἐν ταῖς Ἐκκλησιαζούσαις ἀμφίβολον, "σωτηρίας τετραστατήρου", εἴτε ροπήν εἴτε ἀριθμὸν λέγει (Pollux IX, 58). The same ambiguity is expressed by the contrast between price (τιμή) and weight (ροπή). When no specifics are mentioned, and the context calls for a monetary use, we may well assume monetary reality. Solon's legislation is full of such materially unspecified penalties. Cf. in particular F365: ἐξούλης· ἐάν τις ἐξείλλη, ὧν ἂν τις δίκην νικήσῃ, ὅπόσου ἂν ἄξιον ἦ, εἰς δημόσιον ὀφείλειν καὶ τῷ ιδιώτῃ, ἑκατέρω ἴσον. Also F68 = Lys. 10,18: τὸ ἀργύριον στάσιμον θείναι, ἐφ' ὅπόσω ἂν βούληται ὁ δανείζων. He divided the classes, presents the ancient appellations, but substituting money for the produce; F77: εἰς μὲν γε τὰ τιμήματα λογίζεται πρόβατον καὶ δραχμὴν ἀντὶ μεδίμνου. F79: τοὺς ναυκράρους εἰσπράττειν καὶ ἀναλίσκειν ἐκ τοῦ ναυκραρικοῦ ἀργυρίου (cf. Androtion FGrHist 324F36). Cf. F81; 92 (= Demetrius of Ph. 117). Cf. 143b etc.

About the same time, at the beginning of 6th century, Alcaeus presupposes widespread use of coinage. Fr. 63 Voigt:

χε]λίους στάτ[ηρας.

And Fr. 69:

Ζεῦ πάτερ, Λῦδοι μὲν ἐπασχαλάσαντες
 συμφόραιοσι δισχελίοις στάτηρας
 ἄμμ' ἔδωκαν, αἴ κε δυναίμεθ' ἴσ[
 ἐς πόλιν ἔλθην,
 οὐ παθόντες οὐδὰμα πῶσλον οὐδὲν
 οὐδὲ γινώσκοντες.

The currency market was essentially free. If more metal was coined than the level of economic activity, and the effective demand for money, would require, the value of the currency would fall, and as a result less metal would be presented for coinage. If there was a scarcity in the circulating medium, its value would appreciate, and thus more metal would be brought in for stamping. It is immaterial that (or initially whether) the State reserved the monopoly of money production, once money operated in an open, real and financial market-system.

Such a natural system of spontaneous self-adjustment (an essentially free market in the production of money, as well as in economy in general) is presupposed by the much abused Xenophontian analysis, where he advises the intenser exploitation of the Laureion mines. His main argument is that increased silver production does not lower its price, unlike what happens with any other work (product or service). This means long-term stability of the value of money (and of prices), which could come in the circumstances only from the operation of fundamentally free financial and real markets. The point is rendered manifest by Xenophon's remark that although gold behaves sufficiently similarly to silver, yet its abundance does depress its price, pushing simultaneously silver higher (*Πόροι*, IV, 10). Despite the scorn that has been leveled on this piece of analysis in particular, Xenophon is right according to this theory. Silver being the monetary

commodity in the Athenian world, and being naturally adjusted to the intensity of real economic activity, does not suffer in price from overproduction, assuming a corresponding rate of growth in the real economy. In the absence of institutionalized management of the financial sector, that could only happen in a natural and free system, i.e. in a quintessential market. Gold, on the other hand, was, so to speak, half-monetary material in Greece, because of its monetary uses in the Persian Empire. Thus although it behaved differently from the other goods, yet, esp. when variations in its quantity were more violent, it made conspicuous its difference from the proper monetary role of silver.

Concurrent currencies were normal situation in a free market currency system. In Rhodes the three main cities struck coins on different standards, Camirus using the Aeginetan, Lindos the Milesian and Ialysus coining on an individual standard of her own. They would naturally interchange among them their moneys. In Chios Electrum coins were struck on the Milesian standard, but silver emissions settled down to a standard peculiar to this island (2 dr. = c. 7.80 gr.). The numismatic complexity of the ThracοMacedonian monetary area, and the differing and overlapping (sometimes ambiguous) standards in Great Greece and Sicily point in the same direction. As does the long, apparent absence of emissions from states actively engaged in international trade (e.g. Byzantium). The tradition of free con-currency had been preserved in the Near and Middle East: in the Ottoman Empire decads of different currencies were freely circulating and exchanged, being perfectly legal tender by the side of the State's emissions. Attempted tabulation of an extremely complicated monetary landscape normally reflected the actual market reality; when they were arbitrary attempts at fixation, they usually failed miserably pretty soon. The freedom of financial activity was evident in the freedom of setting interest rates between the contracting partners in the credit domain (Solon's law F15b), unencumbered by the determinations of any lender of the last resort. *The nonexistence of a Central Bank, even under highly developed financial structures, should be duly appreciated, not as a primitive relic in classical economy, but as an essential characteristic of it, its maximal unregulation.*

Of course, once the conventional character of the monetary function is understood, political power will occasionally succumb to the temptation of interference in the money market and foreign exchange, *basically mistaking fiduciarity for arbitrariness*, and wishfully supposing that *what is not determined by nature specifically, can be validated by force*. *But the monetary function and its structured articulation is natural; what is conventional is its concrete carrier. And even this latter is decided by an objective fact, that of its universal or widespread acceptance. Money is what is taken as money by the market. Fiat money (and all money, even commodity one, is fiduciary) is neither faked money, nor forced money.*

Examples of *enforced* monetary circulation are certainly well attested. Dionysius the Tyrant *obliged* (κατηνάγκασε) the Syracusans to accept and “believe” (νομίσαι) tin money, whose standard he fixed at 4 Attic silver drachms (instead of one); Pollux IX, 79. An inscription from the Cretan Gortys (TN 334 = IC IV 162) records the decision to implement the forced circulation of a copper coinage and the prohibition of circulation of sound silver money under heavy penalties to be exacted in the prohibited silver coinage! The Athenian Imperial Decree of imposition of the Athenian money and weight system as exclusive currency and weight standard in the entire Athenian dominated economic area is something different: it reflects an actual situation (prevalence of the Attic money) and pushes it further towards an intenser integration of the whole field (Meiggs and Lewis No 45, 450-446 B.C.). On the other hand and end we have the example of Olbia on the Black Sea coast, where a free and totally tax-exempted currency market is created, functioning through the intermediacy of the local coinage which is pegged to an international currency, the Cyzicene Electrum stater (TN No. 349). The Athenian Coinage Law of 375/4 B.C. specifies that even foreign monetary productions that bear the Attic stamp is valid money and is to be accepted as legal tender if it is sound (ἐὰν καλόν). In Athens, retail trade could be done simultaneously with two currencies, like selling goods against Aeginetan currency while returning change in Attic (Diphilos 67, PC Gr V 92). Hayek’s daring proposal of concurrent currencies

was actual reality. As in many cases, the seeming primitivism of ancient economy turns out on closer investigation to be avant-garde modernism.

Revising upwards Aeginetan and Athenian numismatic chronology would facilitate pushing further back Lydian and Ionian currency, supporting the earlier dating of, crucially, the Artemision hoard while removing any chronological obstacles to the genuineness of the Clazomenian one. The human form depicted in the M1-M4 Clazomenian hoard stators firmly locates stylistically these coins towards the end of the third quarter of the seventh century. The representation (clearly a homosexual encounter cf. Isik, Furtwängler) fits in well to the exquisite luxuriousness of the Ionians. Cf. Asius Fr. 13 Bernabé, for the Samians; Xenophanes Fr. 3 Diehl = 3 West, for the Colophonians; Callinus (c. mid VII century) Fr. 3 West for the Magnesians-on-the-Maeander; cf. Archilochus Fr. 20 West; Athenaeus XII, 523e-524b for the Milesians; 525c-e for the Ephesians; 526a-c for the Colophonians; generally for the Ionians, 526d.

Around 700 B.C. a major step was taken in the formative process of Hellenic culture. It took place amidst a quickening pace in Greek commercial activity over an expanding economic area, that accompanied the wave of second colonization which had started with the 8th century "Renaissance". Two fields of human creativity that bear witness to that step are representational art and poetry.

In art the transition of late geometric to early archaic amounted in essence to the progress *from pattern to form*. Ornamental order gains a meaningful focus and becomes an organic structure. Form is now the essence of things (to speak in Aristotelian terms), the source of their *articulate unity*, the power of cohesion in a functional division of a whole into parts. This awareness of form, formal unity and formal perfection can best be observed in plastic works. A triad of bronze statuettes (a helmeted young man from Delphi, and two helmeted and girdled lance throwers from Olympia) usher us in the new world of characteristic Greek excellence. In the Mantiklos-Apollon from Boeotia the new spirit can be observed in its dazzling and

daring and self-assured affirmation. While a young man from Delphi codifies the achievements of the first stage in the development that will lead to the classic.

In a remarkable parallelism of development, the same age sees the emergence of major poetical figures and of major poetical genres outside the epic or hymnic tradition. Archilochus before 650 B.C. (ἐπὶ Γύγου, c. 687-652) founds iambic poetry. Alcman (significantly of Lydian origin but active in Sparta) at the same time institutes lyric poetry. He mentioned Polymnestos from Colophon. Tyrtaeus from Miletus sings for the Spartans in the 2nd Messenian War. Callinus of Ephesus again in the first half of the 7th century works in Elegies. Traditional religious festivities are transformed by the new spirit: popular dances and songs become high art. Terpander wins the first new style Carneia in Sparta in 676 B.C. Thaletas is reputed to have done the same in the first new Spartan Γυμνοπαιδείαι around 665 B.C.

The common and connecting element in these revolutions in both pictorial art and poetry is a unique experience of the *ideal-real*. Man's existence, in its full actuality, is being conceived as displaying the same order, as being governed by the same laws, that were previously conceived to characterize divine reality or (in the epic projection) at most the heroic realm, be it of the (mythologized) past. beauty is now around us, not residing exclusively in Gods and Heroes. The full perfection of existence is achievable by man. A culture of excellence emerges, excellence not as a utopian ideal to be envisioned for the End of Time, but as a living reality, an ideal turned actual here and now. That was a formative moment for the Greek mind, for its consummate blossoming to follow. Greek man had proudly (some will say arrogantly) started in the road to human divinization.

The revolutionary experience would find its speculative expression in philosophy as novel form of human enterprise in general, and as specific philosophical thought that unfolded itself in the course of time. But the invention of coinage parallels exactly in the immediacy of its awareness, and roughly synchronizes, with the discovery of essential form and the birth of lyricism. The

concretization of abstract value is a homogeneous phenomenon to the concretization of ideal beauty and to the concretization of timeless poeticity. (As it is to the concretization of divine, metaphysical principles at a later and higher level of consciousness.) Coinage shows in actual fact the workings of value, similarly to the way that the new-style sculpture shows *in concreto* how form provides the unifying principle of a whole's existence, and also to the way that in lyric poetry particular circumstance and personal experience become replete with objective significance and transcendental meaning. Coinage completed all monetary functions into the integral of money; as corporeal form by the sheer power of its material structure infused particular existence with transcendent beauty; and as lyric poetry sublimates the personal from its momentary accidentality to timeless meaning. The three worked together complementarily and cumulatively. A novel experience was born: The ideal exists, *in* the real. It acts in and through the real. It empowers the actual. It is its essential force. There was a mystery, and a magic and a sacredness that went with all three revolutionary products, coinage and archaic plasticity and lyric poetry. The impression caused must have been *monumental*. The Greeks forged monumentality out of their traditions and Greek architecture started from this foundational experience. *But the mystique was pragmatic*. The Hellenic mind discovered *the pragmatism of the ideal*, something lost since then to the European world with its utopian and romantic idealism.

On a priori reasons, therefore, coinage should have begun in the beginning of the 7th century.