An Analysis of Electrum Coinage in Ancient Greece

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Introduction

In the United States, it is not difficult to demonstrate the importance of the origins of American money. Without benefit of American currency, industry in America would have never been able to grow at such an accelerated rate. More specifically, as Friedman and Schwartz describe in *A Monetary History of the United States*, if in the early days of the American government, U.S. bills do not quickly become trusted as a legitimate currency, it is easy to imagine a United States in which people would not want to invest their money.¹ This, in turn, would have undoubtedly led to a sluggish economy, greatly changing the course of events. Furthermore, while there was a multitude of setbacks in the formation of the American monetary regime, it developed in a unique way that can only be thoroughly understood with the knowledge of its origin. Perhaps just as important, when we focus on early United States History, it is evident that scholars have ample data which they use to describe the circumstances surrounding the creation of American money, enabling them to build on a firm foundation. For example, Alexander Hamilton, the first Secretary of the United States Treasury, through certain endeavors like the founding of a national bank and the development of an efficient tax system, developed a bimetallic monetary regime with long-term price stability.² Among other things, this had the effect of making foreign governments comfortable investing their savings in the U.S. government by purchasing treasury bonds. Therefore, it seems that not only is it necessary to study the origin of money in a nation, but it is also helpful when historians are capable of looking at the beginnings of an economic system with greater detail.


This thesis focuses on a much earlier time period: archaic Greece. What makes the Greeks a compelling research subject is that not only do they, like the Americans, produce some of the first coins in their geographic region, but they are also actually one of the original inventors of money. As David Schaps points out in his book The Invention of Coinage and the Monetization of Ancient Greece, “Coined money [is] invented. It [is] invented in three times and places—Greece or Asia Minor, India, and China—that we can determine with what passes, at this distance, for reasonable exactness.”

When one examines the monetary history of the ancient Greeks, one is, therefore, also looking at a civilization that lays the groundwork for many societies to come.

Studying the creation of money is especially important because, unlike most inventions, it revolutionizes the behavior of humankind. As Schaps puts it, “money, particularly coined money, [is] another invention that irrevocably [changes] people’s way of thought.” Today we recognize that most of social behavior revolves around various forms of money. Corporations develop ways to acquire more of it, charities strive to help their cause by raising it, and people spend a large part of their lives working for it. There is even a whole discipline in academia known as economics — that did not exist in its current form for the Greeks — devoted to the study of how the flow of money affects people’s livelihood. Even so, one may wonder what it is about money that enables it to have such a large impact. It is held that it completely changed the course of human history: but why?

One way to answer this question is to look at four characteristics of money that make it culturally dynamic. First, money serves as a medium of exchange. Without money to use in

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4 Schaps Invention of Coinage 1-2.
5 Schaps Invention of Coinage 2-3.
economic transactions, people are compelled to waste time bartering with one another. For example, a person looking for a new horse not only has to find someone willing to sell a horse, but also has to make sure he has something needed of similar value the person with the horse would be willing to accept in a trade. This produces an economically inefficient result because people have to spend a large amount of time finding someone else with whom they can make a trade. These are transaction costs. On the other hand, with the use of money things are greatly simplified as the only thing the two people have to agree on is the amount of coin for which the horse will be bought. The person selling the horse accepts the money because he knows that he can later use it to make another purchase when he decides to buy something else in the future.

There is evidence that even the ancient Greeks recognized the practicality of money being used as a medium for exchange. Aristotle, for example, in the first book of the Politics, mentions that, “of everything which we possess there are two uses.” He goes on to discuss that any object, such as a shoe, can either be used for the original purpose for which it is made -- in this case as something to put on one’s foot when walking -- or as a thing to be exchanged for something else. He realizes that this second purpose of the object eventually falls into disuse as the coin is invented which then becomes the primary means of exchange. In other words, the shoe may be used for barter but, eventually, as money comes into being and serves as a medium of exchange, it no longer exists to serve such a purpose.

Second, economists recognize that money acts as a standard of value. It is difficult to compare two unlike things unless one has a fixed means of comparison. To give a contemporary example, it is easy to label a pack of gum as costing $1.50. The alternative to money is to use other items and say that it costs something like four and a half chocolate candies to purchase one pack of gum. The problem with this system is that whenever a customer wants to trade

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6 *Rep.* II, 371b; Arist. *Pol.* I, 9.7-8 (1257a31-41), Plato was aware of the same concept (*Rep.* II, 371b).
something other than chocolate candies for the gum, a new price -- one that compares the gum to whichever item the customer wishes to trade -- has to be made. To make matters worse, chocolate candies may also be quite variable in size and quality, and hence value. This is inefficient because both the person selling the item and the customer have to spend time sifting through and coming up with the appropriate prices. Money eliminates this inconvenience by making it so that there is only one price. This example of chocolate candies may seem frivolous, until we remember how archaic Greeks used tripods, cauldrons, and metal spits as media of exchange and evaluation.

In an article titled Iron Money and the Ideology of Consumption in Laconia, Thomas Figueira studies Spartan iron money as a socioeconomic phenomenon. Unlike people in other areas of ancient Greece, the Spartans used iron ingots that were extremely cumbersome for trade. As Figueira writes, “to deprive iron money of convenience as a transactional medium, treatment with vinegar made subsequent utilization of the metal difficult, at least without reprocessing.” The coins were also extremely heavy. A yoke of oxen was needed to transport an amount worth only a small value of ingots. In addition, other currency was not allowed in Laconia. Fearing that coins made from precious metals would cause corruption and other crime, Spartan leaders barred money made from gold and silver. Thus, even in this case where people in ancient Greece theoretically had a rudimentary form of money that they could have used as a standard of value to make transactions amongst them easier, the heavy weight and the way in which the iron ingots were processed made them unusable in many situations, leaving people with little choice but to barter with one another.

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8 Figueira “Iron Money” 138-40.
Besides being a medium of exchange and a standard of value, economists also consider money as something that is able to store as well as represent value. Especially in ancient Greece, for example, where refrigeration was nonexistent and many goods were perishable, people had to sell things like their excess produce quickly in fear that it would soon spoil and become worthless. Fortunately, when people receive money in a sale, they do not have to worry about spending it right away. They can instead put the money aside, knowing that it will maintain its value until they are ready to make a purchase in the future.

Lastly, money acts as a means of compensation or reparation. For example, in a situation where one person assaults another and inflicts some kind of injury, the attacker may be compelled to pay the victim money as part of his punishment. Upon initial examination, one may not see the difference between this and using money as a medium of exchange. But looking more closely, one can see that that money in this role is different because the victim would have never willingly “exchanged” being injured with money in the first place. The victim does, however, accept the money as part of the compensation for his damages. In all, the fact that money is used as a means of compensation and medium of exchange as well as a standard and store of value means that it has many uses which, in turn, enables it to have an enormous impact on civilization after it is invented. Thus, when one studies the invention of money, one is looking at the beginnings of an invention that has an immeasurable influence on not just ancient Greece, but on virtually all successive societies.

While it is clear that the ancient Greeks recognize the significance of money, it is also interesting to note that many do not accept it into their society without some reservations. For example, Aristophanes cautions that if every person in Greece somehow managed to obtain a large sum of money, no one would have an incentive to work. Wealthy people would not occupy
their time with tedious professions to become bronze-smiths or other types of workmen. And though we now know that it is highly improbable to have a society in which everyone is wealthy in terms of contemporary socio-cultural values, Aristophanes skepticism is indicative of the negative feelings certain Greeks possess towards money.

Ancient Greek monetary history which is examined in this thesis is a challenging subject because its distance in the past means that there is little surviving evidence. Yet, to return to our earlier comparison, historians of post-revolutionary America, who have access to ample economic data, still struggle to appreciate or even find certain obscure facts. For example, scholars still debate the effect on bank profit when new banks were chartered shortly after the founding of a national government. Our difficulties in analysis are compounded by a historical distance of two and a half thousand years. To help remedy this lack of information, scholars of Greek history typically rely on three categories of source material: literary texts, inscriptions, and archaeological findings. Examples of relevant literary texts include Aristotle’s Politics and Hesiod’s Work and Days, both of which cover a variety of issues including astronomy, farming, and justice. In addition, as Austin and Vidal-Naquet explain in their Economic & Social History of Ancient Greece, inscriptions provide historians with a rich source of information. Unfortunately for our subject, it is not until democracy firmly takes root in Athens in the middle of the fifth century BC, “that the practice of publishing public documents more or less systematically (such as decrees, treaties, etc.) [becomes] general.”

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9 Aristophanes Wealth 510-16.


coins, and especially the first electrum coins, are minted much earlier and so inscriptions will not play as large a role for us as they do in other research on ancient Greece.

Lastly, archaeology contributes an enormous amount of evidence. Especially when studying ancient money, much of what scholars know comes from the discovery and analysis of coins. And not only does archeology help uncover new information (as one would expect), but it can also confirm or correct what historians already thought they knew about the ancient world. Examples of archaeology playing this type of role are many, including an important study done on the activity of the Greeks in Egypt in the archaic period.\textsuperscript{12} With respect to the research examined in this paper, this type of revision is important because as technology advances, scholars are better equipped to date and determine the composition of coins. In some cases, where scholars believed coins to derive from a certain date range, a new analysis of these coins may reveal them to belong, in fact, to a different era. As a result, it will be necessary to make sure that the data used in this thesis reflects the most recent scholarship.

When examining the origins of coinage in ancient Greece, it is important to understand certain basic facts about history’s first coined money. This is because, unlike the currency used later in the ancient world, the first coins were made out of an alloy of gold and silver, with some copper, called electrum. And, though most coins produced from the alloy have a standardized weight, the proportions of the three metals found in individual coinages are highly variable.\textsuperscript{13} Thus, even though one coin may superficially seem like an exact copy of another, it may nevertheless contain less gold or silver, leading scholars to speculate whether it consequently had the same value for its users. This phenomenon leads to a number of questions which will be closely examined in this paper. What is the true reason behind the origin of the coins? Were the

\textsuperscript{12} M.M. Austin, \textit{Greece and Egypt in the Archaic Age} (Cambridge, 1970).

\textsuperscript{13} Sture Bolin, \textit{State and Currency in the Roman Empire} (Stockholm, 1958), 23-4.
people that used electrum coins in archaic Greece aware of the differences in composition between two coins weighing the same amount? If they were, did they have a reliable method of assigning a value to the coins? Examining the scholarship done in this area closely, it seems that scholars have yet to reach a complete consensus. Nevertheless, it is also clear that there are particular interpretations that are more plausible than the others.

At this point, before going into further detail about the theories discussing why electrum coins were struck, it is helpful to first get a better idea of how electrum coins were made. Unlike the mass-production techniques that assemble many modern goods, ancient coins, “were individually created under conditions far from ideal.”14 The ancient Greek artisan first made what is called an “obverse die” by carving the design or type (in Greek kharaktēr) he wanted to appear on the front of the coin into a thick bronze disk. The obverse die was then placed inside a block with a circular hole in it called an anvil. Another block-like instrument called the punch, also made by the artisan, had a different insignia carved into its base. Called the “reverse die,” this second design eventually appeared as well on the bottom of the finished coin. With all of these tools made and in place, a workman could take the blank (whether of gold, silver, or electrum), that was a piece of plain metal molded into the shape of a coin, and use tongs to insert it into a furnace. Once malleable and heated to the proper consistency, the blank was placed inside the anvil on top of the obverse die. The punch with the reverse die was then placed on top of the blank. After a forceful strike of a hammer, the electrum -- now with a type on both sides -- was removed and allowed to cool, becoming a finished coin.15

Colin M. Kraay, in his book Archaic and Classical Greek Coins, explains that one can analyze ancient coins by drawing conclusions about the dies from which they were struck.

14 Zaner H. Klawans, An Outline of Ancient Greek Coins (Racine, 1964), 11.
15 Klawans Outline of Ancient Greek Coins 11-13.
Although it is rare for the die itself to survive, one can look at the coin and after close examination judge certain characteristics about the implements which produced it. Comparing one coin to the next, one can even determine things such as which coins were struck by the same die, a phenomenon called die linkage.¹⁶ This, in turn, provides valuable information since two coins of one die were both produced at the same mint in similar circumstances. For example, one can learn about the succession of coins and the number of coins produced in a series or by a whole mint. Furthermore, coins are generally found in a hoard. More specifically, a hoard is where a, “group of coins, whether intentionally or unintentionally, [is abandoned] at a particular moment in time.”¹⁷ Sometimes a hoard may only be one man’s meager personal savings, other times it may consist of a vast quantity of extremely valuable coins. Either way, hoards provide historians with useful information such as the sequence of a particular series of coin issues, the length of time some coins survived in circulation, or the areas in which certain coins were accepted as a legitimate form of currency.

Chapter 1: The Origin of Ancient Coinage

The first coins in Greece were struck with electrum most likely in the western Anatolian region around 600 B.C.¹⁸ Although many historians have suggested reasons why such coins were originated, a consensus is yet to be found. The difficulty in developing a plausible theory of origin stems from two seemingly contradictory characteristics that the currency possesses. First,

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¹⁷ *Kraay Introduction* xxiii.

as we have already seen, the coins were precisely standardized by weight. For example, in a particular hoard of electrum coins nicknamed the “twin rooster” series, there are two coins from the same die. One of them weighs 7.15 grams while the other is an almost identical 7.16 grams. Examining the rest of the hoard, the same pattern ensues: all the coins of the same type have almost precisely the same weight.\(^{19}\)

Second, in both the naturally occurring electrum alloy and the resulting coins produced from the metal, the amount of gold and silver found within varies significantly. For example, the electrum from which the coins were struck in archaic Greece sometimes has a silver composition as low as 10% silver while other times it reached a high of 30%.\(^{20}\) An analysis reported by Robert Wallace confirms this hypothesis: “the silver content of early electrum coins ranges, approximately, from 20% to 75%, with the great majority of coins having more than 45% silver.”\(^{21}\)

The reason these two characteristics are contradictory is because the precisely standardized weight of the coins implies that great care was taken to ensure uniformity. For someone working with archaic Greek levels of technology, it takes a large amount of effort to mint two coins that weigh almost precisely the same amount. Therefore, it seems logical to think that the Greeks would not have made that effort without a purpose, that being to designate all coins of a certain weight to be worth the same amount. On the other hand, the variation of the amount of precious metal within the electrum coins suggests that the weight of the coin was insignificant. That is because, even in ancient times, gold was worth significantly more than

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\(^{19}\) Wallace AJA (1987) 385-86.


\(^{21}\) Wallace AJA (1987) 386-87.
silver, and copper was much less valuable than the other two aforementioned metals. So, coins could have been the same weight as each other yet worth different amounts. As Sture Bolin explains, “[Lydian electrum coins] have a uniform weight but their metallic value fluctuates so widely that the metal in one coin may be worth one and a half times as much as the metal in another.”

Why, then, did the Greeks take the time to produce standardized coins when evidence seems to indicate that, despite their efforts, the coins were, nevertheless, variant in value from one another? In order to develop a convincing theory that explains the origin of electrum coins, one therefore needs a plausible explanation that incorporates the existence of these two characteristics.

An even more quantifiable way to look at the coin data exists. There is a particular group of 61 electrum coins, referred to as of the type “Lion’s head facing right” that has enough weight measurements available to allow for accurate comparisons. These are thought to have been made by the kingdom of Lydia, traditionally placing them in the third quarter of the seventh century B.C. (though some recent scholarship brings down their dates). For further reference, a picture of a coin from the group can be found at the end of this paragraph. As it turns out, the average weight of the coins is 4.690 grams and the mean deviation of the weight is only .85%. In addition, 93.4% of the coins in the group differ from the average by less than 2% and the normal variation in weight is only 2.9%. Thus, when looking at the data statistically, one is led to the same conclusion as before: electrum coins of the same type have closely similar weights to one another.

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22 Bolin State and Currency 40.

23 B.V. Head, Historia Numorum; a Manual of Greek Numismatics, (Sanford J Durst), 644-50.
It is important to note that even in the production of modern coins, there is always a significant amount of weight variation allowed by the mint. In Germany, if two gold coins made in the years leading up to the First World War had a difference in weight that was .5%, for example, then that was considered normal. Furthermore, such a means of comparison is applicable only to newly issued coins. This is because the older a particular coin is -- be it a modern U.S. penny or an ancient stamped piece of electrum -- the more variable in weight it becomes as coins lose different amounts of metal through use as they continuously pass from one hand to another. The fact that the weight of ancient electrum coins is so uniform is therefore quite impressive, especially when one remembers the fact that they were individually crafted by artisans and workmen thousands of years ago.

Following this paragraph there is a graphical illustration of the content analysis that has been done with some of the “Lion’s head facing right” electrum coins. The data comes from a multitude of sources, but a conglomerate of it can be found in a chart in Bolin’s State and Currency.

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Before delving into the theories about the origin of electrum coinage, there is another question that remains to be answered. That is, why does one even make the effort to search for the motivations behind those that first make the electrum coins? After all, as David Schaps points out, “we shall never know for certain. The inventor, of whose name we are utterly ignorant and

\[^{25}\text{Bolin State and Currency 24.}\]
whose nationality we can only approximate, will never tell us." While this may be true, there is still something useful to be discovered. There must have been a compelling reason to mint the first electrum coins. It requires a great amount of effort to take bullion, mold it into the shape of a coin, make sure it has a certain weight, and stamp it with the appropriate die. A well-known principle of economics that applies to virtually all human behavior states that people respond to incentives. Behavior changes only when the perceptions of the costs or benefits change. The makers of electrum coins must have therefore had something to gain from production of the coins, giving them an incentive to mint the currency. Looking at things logically, it is also clear that in order for someone to gain from making electrum currency, the coinage must have provided some service or filled some kind of need in ancient Greece. If one is able to deduce what this may be, one will extrapolate a great amount of valuable information about the economy of one of history’s earliest civilizations, making studying the origin of coinage worthwhile.

Having the necessary background information in place, we can now turn to the various theories historians have for the origin of electrum coins. This thesis examines the theories by explaining a hypothesis, giving its supporting data, and then seeing if there is any evidence to the contrary. To start, it will be helpful to look at one of the more obvious conclusions that many people have reached: electrum coins were made to facilitate trade. According to this view, merchants and others involved in the market economy circulated the coins among themselves to pay quickly for transactions. This made trade easier because no one had to spend time weighing the coins as one did when dealing with bullion. The coin’s weight, and consequently its corresponding value, could be determined simply by looking at the inscription on the coin. This

26 Schaps Invention of Coinage 96-97.

is similar to what happens in contemporary society. When a customer buys something with a U.S. bill, for example, the person working the cash machine instantaneously recognizes how much the money is worth and the whole transaction can happen in a short amount of time. Virtually every society aspires to this ideal because it produces economically efficient results and, according to some, is the reason the Greeks minted electrum.

Interestingly, forms of this view have been around since ancient times. In his Politics, Aristotle states the following:

When the inhabitants of one country became more dependent on those of another, and they imported what they needed, and exported what they had too much of, money necessarily came into use. For the various necessaries of life are not easily carried about, and hence men agreed to employ in their dealings with each other something which was intrinsically useful and easily applicable to the purposes of life, for example, iron, silver, and the like. Of this the value was at first measured simply by size and weight, but in process of time they put a stamp upon it, to save the trouble of weighing to mark the value.

When saying that “money necessarily came into use,” Aristotle means that money is invented in order to facilitate trade. It is burdensome for people to continuously barter with one another and so, with time, they agree to use a currency to speed up market transactions. In this passage, however, Aristotle’s intentions are unclear when he talks about the inhabitants of a “country.” Perhaps he is referring to the Greeks trading with distance lands. On the other hand, he may more simply be referencing the economic interaction between nearby regions in archaic Greece. Either way, we can say that Aristotle is among the first theorists to make the claim that Greek coins were minted to make trade easier. Several hundred years later, the Roman jurist Julius Prudentissimus echoes a similar sentiment. In Schaps’ book, there is a passage quoted from Prudentissimus’ commentary on Digest 18.1.1 which reads as follows:

For once there was no such thing as coin... but everybody would exchange what he did not need for what he did, according to the needs of the time and the situation, since it

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often happens that one person has too little of that which another has too much. But since it neither always nor easily happened that when you had what I needed, I, in turn, had something that you were willing to accept, a material was chosen to have a fixed value, guaranteed by the state, which could help the difficulties of exchange by equalizing its quantity. That material, struck by the state, shows its use and title not so much by its substance as by its quantity, and no longer are both items called commodities, but rather one of them is called the price.\(^{29}\)

Here, Prudentissimus writes of a time where money does not exist. And, similarly to Aristotle, he implies that money is created to replace the economically inefficient task of barter. In other words, the invention of coin helps make trade between people easier because they no longer have to spend time exchanging items that need to be desirable to the other person. Whenever someone finds something he wishes to purchase, he can instead pay for it in currency, which the seller will accept because he knows he can use the money in the future to buy whatever it is he seeks.

Prudentissimus also claims that the state is the institution that first creates the currency. This, however, should not be accepted without further investigation. While it is true that most scholars have come to agree that it would be necessary for an entity to have powers similar to that of a typical state to mint coins successfully, some believe that private issuers were the first to make electrum currency.\(^{30}\)

This theory, sometimes known today as the concept of “practical convenience,” however, is one that many scholars no longer support. In a 1964 article titled “Hoard, Small Change and the Origin of Coinage,” Colin M. Kraay points out numerous flaws in the hypothesis of “practical convenience.” First and foremost, as has already been shown, it is clear that the amount of gold and silver found within any two electrum coins, even if they weigh the same amount, is not the same. This poses a problem because it is unlikely that people living in ancient Greece would have readily accepted electrum coins if the amount and, in turn, the corresponding

\(^{29}\) Schaps *Invention of Coinage* 99-100.

value of the metal comprising the coin was not consistent. Returning to the modern-day analogy, an electrum coin would be the equivalent to a U.S. bill that indicates it is worth $20, but because the material it is made of is both valuable and inconsistent from one bill to the next, it can actually be worth $15 or perhaps $25. Clearly, not many people would use U.S. money for their routine purchases if such were the case, and the same is true of archaic Greece.

There are other reasons to believe that electrum coins were unsuitable for everyday transactions. When looking at the supply of the first coins, it is clear that, “few of even the most important Greek states possessed a regular supply of small denominations adequate for this purpose.” 31 Similarly, there were many places in ancient Greece -- all the way until the sixth century -- that had no coins. If electrum currency was created as a practical convenience, one would find early coins scattered throughout all of Greece. This is because, as with any currency used for such purposes, the coins would have rapidly changed hands as new things were bought, with the consequence being that we would find abandoned coins dispersed where trade is thought to have been conducted in Greece. In reality, such a situation does not exist. 32 In addition, unlike certain silver currency that emerged later, electrum coins were highly valuable. So much, in fact, that, even at their smallest fractions, the coins were worth too much to use for routine purchases.

In today’s society, when people make economic transactions while doing commonplace things like grocery shopping, they pay for their purchases in cash using money that consists of both large and small denominations of value. If limited to only highly valuable instruments like $100 bills, shopping would be extremely inconvenient as people would have to purchase a great

32 Kraay “Origin of Coinage” 88.
amount of groceries to justify spending so much money. Small, routine transactions would therefore not occur. The same principle applies to ancient Greece.

There is also no evidence for the circulation of early Greek coins outside their area of production.\textsuperscript{33} If it were true that the Greeks used their currency to trade with foreign peoples like the Egyptians, one would expect to see some of their earliest coins in hoards found in foreign lands. This, however, is not the case. Scholars still in support of the foreign trade hypothesis try to rationalize this circumstance by suggesting that the coins returned to their place of origin because of a premium for their value there. In their view, because of familiarity the coins were more easily accepted and worth more in the area around which they were struck. It therefore makes sense, at least according to them, for the coins to have eventually migrated back to the area of their creation after they were used for foreign trade.\textsuperscript{34} But there is a flaw in this line of reasoning. If electrum coins lost some of their value when traded to merchants from other lands, it does not make sense for the Greeks to have used the coins in such a capacity in the first place. They would instead have used something like bullion which would not only have cost less to produce and handle, but tended to hold its value more readily no matter where it was circulated.\textsuperscript{35} However, it is best to not spend too much time focusing on this argument. Many scholars have already addressed the issue, and it is better to concentrate on the other, stronger arguments.\textsuperscript{36}


\textsuperscript{34} Holloway 1978, 11-12, and O. Murray, \textit{Early Greece} (Stanford 1980) 225.


At first glance it is not difficult to see how first Aristotle and then later Prudentissimus (and a string of other authorities in between) could have thought otherwise. After all, coinage serves this type of purpose today and so it is easy to imagine that it must filled the same role at its inception. Nevertheless, historians now possess key evidence about early coinage that forces scholars to look elsewhere for an interpretation because now one can see that the origin of history’s first coins does not come about because of either local or foreign trade.

Next, there are those, such as R.M. Cook, who believe that Greek coins came into existence as an accommodation to the state. Even as early as 600 B.C., ancient governments probably needed to make many payments to, among other people, mercenary soldiers. Electrum coins could offer a way to do this because they were both highly valuable and uniform in weight. Moreover, a hired soldier may not have been likely to require a precise measurement of the precious metal content in the electrum he received as compensation for his services. Unlike a merchant whose job it was to deal with money on a daily basis, mercenaries were oftentimes occupied with military matters. Therefore, it may not be farfetched to think that it would not have mattered to the typical soldier that the coins he earned had a slightly different gold and silver content when compared to those given to his peers.\footnote{Wallace \textit{AJA} (1987) 385-387.} It may even be true that both the gold content and the resulting appearance of the electrum coins were kept uniform with each installment of issued coins, leaving soldiers unaware that electrum coins were variable over a longer period. Over time, this theory has expanded -- most notably because of Kraay’s scholarship -- to include other types of necessary payments both to and from the government. Examples of such transactions are harbor dues, fines, penalties, and any other tax-like payments.
that existed at the time of electrum.\textsuperscript{38} In its most simple form, a proponent of this view believes that although electrum coins were not widely circulated in ancient Greece, certain people were still willing to accept the coins as payment from the government because they could reuse the currency in specific, future transactions that they knew they would have to make to the state.

Furthermore, there is actually a modern-day example of money being used in such a fashion. In the first half of the twentieth century, some lumber and mining companies in the United States issued certificates to their employees called “scrips” which, unlike regular dollar bills, could only be redeemed for goods at the local company store. When it was time for a worker to be paid, scrip registers dispensed metal tokens that were marked with a special insignia recognizable only by those familiar with that particular company.\textsuperscript{39} In addition, if a worker wanted to receive some of the money that he had already earned in wages before his next official payday, he could do so with a zero interest loan via the scrip system. The desired wages would be given to the worker, with the given amount of money subtracted from his next paycheck.\textsuperscript{40} It should be clear, however, that this does not support the hypothesis that electrum coins were also used in a similar manner. The reason the scrip system worked was because it was a benefit to workers by being an alternative to going to a loan shark or pawn shop in search of extra money in between paychecks: “to the worker [the scrip system] amounted to an interest-free, small sum loan that he could get with almost no effort... to those workers who had ‘gone out and got drunk’ on the previous weekend, or who had suffered some kind of household emergency, scrip was a blessing.”\textsuperscript{41} If the scrips did not have special perks, they would have been cumbersome and not

\textsuperscript{38} Schaps \textit{Invention of Coinage} 98-99.
\textsuperscript{40} Timberlake \textit{Journal of Money, Credit and Banking} (1987) 441-42.
\textsuperscript{41} Timberlake \textit{Journal of Money, Credit and Banking} (1987) 441.
well liked by the workers. Those arguing that electrum was invented to serve a similar purpose make no mention of electrum having special uses similar to the aforementioned scrip system. As a result, the fact that scrips might work in the United States does not imply that a similar system could also have worked in archaic Greece.

Shifting our focus back to ancient Greece, there is a great amount of evidence that proves the “state accommodation” theory incorrect. First, there is the fact that the first coins were struck only from electrum. This does not make sense if one believes that the true purpose of the coinage was to create a standardized method of payment to people like mercenaries. If such were truly the case, ancient coin issuers would use other metals like silver which are not only available locally but also more easily made uniform in composition and therefore more easily standardized than electrum. A defender of the theory may try to counter this with the idea that perhaps people living in the ancient world were unaware of the varying composition of electrum. After all, the modern field of metallurgy can study coins in ways that are leaps and bounds beyond the primitive technology of the Greeks. Robert Wallace nullifies this objection with the observation that, “there is sufficient difference in color between coins of 60% silver and coins of 40% silver to result not in standardized issues, but in endless doubts and disputes over particular coins.”

In other words, even without any scientific tests, it would have been obvious to the ancient Greeks, because of the variation in color, that some electrum coins are composed of different percentaged of gold and silver. And, as will soon be discussed, the Greeks had touchstones and other rudimentary methods of determining the metallic content of pieces of electrum.

In addition, there is no evidence to indicate that mercenary soldiers even existed at this time, let alone that they would not care if their coins were not standardized. Since they were

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risking their lives by fighting in wars, the least they could receive for their services were uniform coins with a steady value. Neither is there enough data to claim that electrum coins were released in installments, with each wave of issues having the same composition and coloration. Furthermore, even if such were the case, people would still eventually realize that the coins were not uniform once the new installment was released. Instead of explaining away the problem, such a theory only postpones it.

At this point, a skeptic may counter with the argument that the issuer used electrum coins to fulfill his own need for distributing subsidies or payments in a way most advantageous to the issuer, regardless of the effects the coins had on the recipients. While there might be some validity to this argument, it does not specify who exactly received the coins as payment. Next, it does not take into account why, all of a sudden, an issuer like the government began to compensate people in coin rather than in bullion. After all, there was no precedent to pay people in coin prior to this. It also does not explain the wide variety of states that began to issue coins so uniformly. If electrum coins were made by a government to pay a specific group of people for their services, why then did other states immediately begin to do the same thing? As Schaps explains, “the coins must have been popular, for they continued to be produced in Lydia and even imitated in Lydia’s Ionian neighbor cities.”

As we will soon see, there exists a different, more plausible theory that better accounts for the invention of electrum coins.

Both the “practical convenience” and “state accommodation” theories fail, in part, because they cannot specifically account for why it is that electrum is used to make the coins instead of silver or some other type of metal. Although electrum does provide a more compact medium for storing value, it has too many problems associated with it to be a viable option in either case. If we turn our attention to a theory that talks about electrum more directly, perhaps

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44 Schaps *Invention of Coinage* 100-01.
we will find an adequate explanation. Historian Sture Bolin does just this in one of his chapters about early coinage in his book State and Currency in the Roman Empire to 300 A.D. So does Robert Wallace in a 1987 article titled “The Origin of Electrum Coinage.” Both of their arguments, however, rest on the assumption that the ancient Greeks did not have a reliable method of valuing ancient electrum coins. As a result, before continuing with the search to discover the origin of electrum coins, it will first be helpful to examine ancient Greek metal valuation techniques.

Chapter 2: Methods of solving the problem associated with electrum

Sture Bolin declares “Here we must place great stress on the fact that the oldest coins are made of an artificial alloy, the content of which was impossible or difficult for the public to check... the public [was not] able to determine their metallic values.” Robert Wallace echoes a similar sentiment when he states “at the time when coinage began ([no] later than ca. 600), under the best circumstances only a very rough estimate of the gold content of electrum could be attempted.” Evidently, since both Bolin and Wallace use this fact as a foundation for their research, it seems that the more likely it is that the public in ancient Greece could accurately value electrum, the less successful either theory would be at explaining the origin of electrum coins. Thus, it is prudent to first examine the available evidence to see just how accurate the ancient Greeks were in determining the value of a piece of electrum coinage.

In Herodotus’ The Histories, one finds a description of the Lydian King Croesus attempting to please a Delphic god with sacrifices and expensive dedications. As part of the

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45 Bolin State and Currency 35.

religious ceremony, King Croesus melted down gold and beat it into equally-sized ingots measuring, “six palms long, three palms wide.”

Because they were the same size and shape, all the ingots had the same volume. Herodotus goes on to note that when the King measured the weight of the ingots, some of which were made out of pure gold and others which were composed of “white gold” (the term Herodotus uses for electrum), those made from pure gold weighed two and a half talents while those made from electrum weighed only two talents. King Croesus, who ruled Lydia from 560 to 547 BC, must have consequently already recognized that electrum was lighter than pure gold. And as even Wallace concedes, “there is no reason to think that this knowledge was new at Croesus’s time.” Putting everything together, it can potentially be the case that the Greeks were able to determine the amount of gold in electrum through a specific gravity measurement. More specifically, this is a measurement where the density of an object is determined by comparing it to the density of water. As King Croesus discovered, pure gold has a higher density than either silver or copper. As a result, if one piece of electrum had a higher density than another, it was safe to assume that the denser one has the larger gold content.

However, Wallace points out that the knowledge of how to perform specific metal calculations on circular objects most likely did not exist during the time of the invention of electrum coinage. He also claims that even if such knowledge was available, the measurements would be inaccurate because natural electrum contained trace metals and air bubbles, both of which distort calculations. Moreover, Wallace is not alone in supporting this conclusion. Other

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47 Hdt. 1.50.2-3.


scholars, most notably J.F. Healy, have developed a similar hypothesis.\textsuperscript{50} This reasoning, however, does have certain limitations. Although believing that the ancient Greeks performed specific gravity tests on finished electrum coins seems somewhat infeasible, there is no conclusive evidence to know this for sure. Additionally, assuming that such measurements were possible, the fact that they would not be precise is not as important as whether the ancient Greeks thought they were precise. As we will soon see, when developing an accurate theory to explain the first coins, we need to know what the Greeks thought about their ability to value electrum because this is what plays a role in minting the coins. Judging how precisely they were actually able to do so, while interesting, is not in itself conclusive.

Another way in which the early Greeks could have potentially determined the worth of an electrum coin was through a touchstone. Black siliceous stones most often used to ascertain the purity of gold or silver, touchstones were used by taking an electrum coin and rubbing it on the stone, leaving behind a streak. A metal of known purity would then also be rubbed adjacent to the electrum, making a second streak. With the addition of a dose of nitric acid to eliminate any impurities in the residue, a comparison of the color in the two streaks could then be made. With this process, the ancient Greeks had a fairly accurate estimate of the amount of gold in any particular electrum coin.\textsuperscript{51} Thus, even if we discount the possibility of a specific gravity measurement, there was theoretically a method available for people living in an ancient society to ascertain the value of electrum coinage. However, is there evidence that those that first minted electrum actually made use of touchstones? The answer is yes. For example, a Greek poet named Theognis who lived around 500 B.C. mentioned the use of a touchstone shortly after the first


electrum coins made an appearance. In addition, more evidence comes from the philosopher Theophrastus who, around the fourth century B.C., claimed that one can test gold by using either fire or a touchstone. And, as Robert Mundell points out, “Theophrastus also [commented] that touchstones are only found at Tmolus in Lydia, the land in which electrum coinage was first used.”

Looking at all the available evidence, one cannot therefore support the view that the ancient Greeks had no reliable method to test the amount of precious metal in ancient coins. With this knowledge at hand, we can now assess what repercussion this determination has on certain theories that explain origin of electrum coinage discussion.

Chapter 3: The Origin of Ancient Coinage, II

When explaining the origin of electrum coinage, Robert Wallace starts with two premises. First, he states that it must have been difficult to use electrum as a medium of exchange. As has already been discussed, there exists a large amount of evidence to support this. But it is his second premise that the market value of electrum fell to a level “not much above silver” that proves to be false. Citing the work of many scholars, Bolin points out something that many modern historians still believe. That is, gold in the seventh century B.C. was worth many times more than silver, most likely somewhere around ten times as much. Figueira, in his book The Power of Money, also points out that, as the mining technology in archaic Greece

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53 Mundell “The Birth of Coinage” 27.


55 Bolin *State and Currency* 23.
improved, “silver may have lost value relative to gold.”\footnote{Figueira \textit{The Power of Money} 95-7.} Because it became much easier to take silver from the earth, it grew to be less rare and, in turn, less valuable. As a result, more likely than not, even in the era of the invention of coinage, gold was substantially more valuable than silver.

Furthermore, as we can see from the graph in the first chapter, electrum coins contain a significant amount of gold. Sometimes the gold content is around 30% while other times it can be as high as just under 60%. We have just seen that this gold content in electrum coins can somewhat precisely be determined with a touchstone. Putting everything together, it is highly unlikely that the Greeks valued electrum to be worth the same amount as pure silver. To state it more logically, when the fact that gold is significantly more valuable than silver is coupled with the fact that the Greeks understand that electrum coins contain a large amount of gold, one must admit that electrum must have been much more valuable on the ancient market than silver.

In his article, Wallace goes on to say that electrum coins were invented in order to stabilize the poor market value of electrum. In support of his theory, he claims that the seal on the obverse of the coin acted to guarantee that the coin would be accepted at a pre-specified amount. If this was true, then it must be the case that electrum coins acted like fiduciary money. In other words, they did not get their worth exclusively from the material from which they were composed, but rather from a promise by the that electrum coins would later be accepted for the same amount as they were when first minted.

Nevertheless, in light of the already-presented evidence, this theory does not adequately explain the origin of electrum coinage. Wallace claims that electrum bullion had a poor market value that needed to be stabilized. But we know that, due to the significant amount of gold it contained, electrum must have had a high market value. Moreover, as we saw earlier, it took a
large amount of time and other resources to mint coins in ancient Greece. Those who minted the coins needed to somehow earn enough profit to justify their efforts. The most efficient way for this to happen was if the value of whichever metal was being struck was as small as possible so the price could then be artificially inflated when it was distributed as a coin. But we now know that, since it contained so much gold, the value of electrum bullion was already substantial. Since Wallace believes history’s first coins acted as a fiduciary money, the metal it was composed of does not have great significance. Thus, one would think that, in order to maximize their profit, the mints would have chosen to produce coins from a less expensive metal, like silver. Perhaps most importantly, we will soon see that the electrum coins were made of an artificial alloy. If the goal of minting the coins was to stabilize the market value of electrum, one would think that all the coins minted would contain the same amount of gold and silver (since it was possible to do so). This not being the case, Wallace’s theory does not hold.

Sture Bolin has a different take on the situation. In particular, he offers insightful analyses when he writes:

[Herodotus] relates that that King Croesus once presented a number of brick-shaped blocks of gold of equal size to the oracle of Delphi. Four of them were of refined gold and each weighed 2.5 talents; the others, which were of white gold, weight 2 talents each. It was long ago pointed out that it is easy to use this information to work out the content of the white gold; it consists of approx. 71% gold... The white gold is clearly not refined and so must correspond to the natural alloy of gold and silver found in Lydia.\(^{57}\)

Thus, Bolin takes certain information given in a valuable primary source and uses it to deduce facts about natural electrum in ancient Greece. This, however, is not the only proof that Lydian natural electrum is made up of around 71% gold: other evidence corroborates this. Although there is yet to be a modern-day analysis of the electrum found in Asia Minor (from which Lydian electrum coins are made), there has been research done on Transylvanian white gold or electrum

\(^{57}\) Bolin State and Currency 28.
with the conclusion being that it has a gold content between 60.5% and 84.9% and an average of approximately 70%. This being both the closest known and most similarly obtained electrum ore to the Asian Minor electrum, it makes sense for one to believe that the natural electrum of Lydia is composed of around 70% gold.

At this point, one should realize that there exists a stark inconsistency. In the graph presented in the first chapter of this thesis, all the electrum coins have a gold content of less than 60%. Some coins even go so far as to dip to about 30% gold. In addition, this is not something that is limited to the small sample of coins that have enough data to be included in the graph. As Bolin explains, “only a very few coins--none of them of the type investigated here--have a gold content which appears to have been that of the natural Lydian alloy.” Since natural electrum in the region had a gold content significantly above Lydian electrum coins, one must conclude that there must have been some kind manipulation: the difference between the two is too large to occur by chance. Thus, contrary to what scholars once believed, the world’s first coins are made from an artificial alloy of gold and silver. Furthermore, in light of this evidence, it is clear that only two options remain. On the one hand, perhaps the Lydians took natural electrum, melted it down, and then added pure silver to the mixture. The coins could then be made from the resulting metal. On the other hand, it may be the case that the Lydians did not use natural electrum at all and instead minted their coins from a more simple combination of pure gold and silver. Either way, extra work was required and so the process of making an electrum coin was even more intricate than what some historians originally suspected.

Judging the distribution of electrum Lydian coins in hoards, it seems that they quickly came into circulation and replaced bullion metal as a means of storing value. One possible explanation for this is that when the coins were minted, the government decreed that electrum

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58 Bolin State and Currency 28.
bullion would no longer to be used in economic transactions. In such a scenario it would necessary for the government to provide a means for its people to take their current precious metals and trade it for usable coins. Upon closer examination, however, this seems somewhat farfetched as there were not enough electrum coins in circulation to make enforcing such rules feasible. Scholars still debate whether the fifth century Athenian decree on silver coinage had any effect on the distribution of silver coins.\textsuperscript{59} It is therefore unlikely that the less powerful governments that existed when electrum was first introduced had any substantial influence. As a result, the true reason for the unique dispersion of Lydian coins is difficult to determine.

When doing this type of research, sometimes it seems that, whenever one question is answered, a new one develops. This is particularly true during this stage of my investigation. Even though we have been able to specify the origin of Greek coinage to the point of confidently concluding that the coins were made from an artificial alloy, an important question arises: “did [the Lydian government] convert the precious metal into coins free of charge, or at cost price or almost free of charge, and did it give back to the merchants an amount of coined precious metal which wholly or almost wholly corresponded to the amount of precious metal handed in?”\textsuperscript{60} To put it differently, since we know that the Lydian government was both aware of and able to alter the amount of gold and silver in each coin it minted, we now wonder whether they charged some form of primitive “seigniorage,” otherwise known as the difference between the value of the money and the cost to produce it. If positive, we can conclude that the Lydian mints accumulated wealth each time they produced a coin. This does not mean that those who gave unstamped electrum metal to the government automatically lost value to their money. It may well be that the purchasing power of electrum increased as it is transformed into a coin. If such was the case,

\textsuperscript{59} Figueira \textit{Power of Money} 219-58.

\textsuperscript{60} Bolin \textit{State and Currency} 31.
then, despite having received coins that were made of less valuable electrum than the bullion they gave, people could still purchase a similar amount of goods and services with their new coinage.

This interpretation of the origin of coinage is significant because it completely changes the approach scholars take when discussing history’s first coins. Many of the theories examined in the earlier pages of this thesis had a “consumer-centered” point of view. They attempted to explain the origin of coinage by focusing on the fact that there must have been some need among merchants and other “consumers” that the coins were able to meet. Later scholars have tried to develop a hybrid view where coinage came into existence because it provided some kind of equal benefit to both producers and consumers. Now, with this producer-centered theory, it may be plausible to hold that the primary purpose for minting electrum coins was to allow the government to slowly accrue gold. After all, as we have already discussed, even if such were the case, it would not be in total detriment to the consumer of the coins. In such a scenario it was not vital for the coins to have had a practical use in order for them to be circulated. Perhaps the reason people traded in their electrum bullion into the mints in exchange for coins was to slightly increase the value of their savings. The official standardization of the coin most likely gave it a higher price than bullion on the market. Thus, it seems that it was not necessary for coinage to serve a significant practical purpose for the consumer in order for it to come into existence. This is in contrast to what earlier theorists had to say on the subject.

While Sture Bolin contributes invaluable insights to the theory of the origin of coinage with his assertion that the Lydians minted artificial electrum, he falters when he writes that the only way in which the public could possibly have accepted electrum coins was if they had no capability to judge the amount of gold within an issue. First, it is difficult to believe that the
Lydian government minted precisely measured electrum coins while, at the same time, the public could not even perform a rudimentary analysis of the percentage composition of gold the coins contained. More likely than not, both the government and the people in Lydia could use touchstones to evaluate electrum. Second, we need to remember that despite the fact that the public was aware of the value and amount of gold in electrum, it is still possible for all the electrum coins of the same weight to have circulated at the same value. Bolin is in agreement with virtually all scholars who study electrum when he states that, since great effort was taken to insure uniformity in weight among the coins, it must be that all the coins of the same weight were circulated at the same value.\footnote{Bolin State and Currency 34-37.} However, for this to be true, it is not necessary for the public to be ignorant of the true value of coinage, as Bolin assumes.

There are multiple facts that all lead to the aforementioned conclusion. First, we know that the people living in ancient Lydia considered electrum to be a separate metal.\footnote{Hammer (1908: 18-21); Burns (1927).} This means that when they looked at electrum, they did not necessarily think of it as a combination of silver, gold, and copper as a modern scientist does. To them, it was a separate entity all together. Thus, it is rational to assume that people in ancient Lydia accepted all electrum coins of a certain type at the same value, even if it was obvious to them that their gold content fluctuates. Second, in this era Lydia is a strong central state that had the ability to force people to use a certain coinage for their transactions. Just like the U.S. government decrees that its bills must be accepted as legal tender for debts, so too was the Lydian government able to do something similar. Nobel Prize winning author Robert Mundell explains the situation:

Let us suppose that the average electrum in Lydia is 70 percent gold. The government of Lydia gets the idea to take in (say) ounces of electrum and return in exchange, stater
coins that are by law homogenous in value and that *must* be exchanged for one another at equal value without concern for purity. Since it is comparatively easy to standardize weight, the new electrum coins have more or less the same weight, according to the tolerance level set by technology and care.\(^\text{63}\)

At this point, some scholars might argue that enforcing acceptance in exchange requires much more state power than enforcing acceptance in receipt of governmental disbursement. According to them, we should therefore be cautious to assume Lydia had this kind of control over money. In reality, it may not have been necessary for the state to police the people extensively in order to make them accept electrum coins at a certain value. It could have more simply been a social norm. In modern society, most people do not litter not because they are afraid of being caught, but because they know society looks down upon such behavior. Similarly, it may be the case that it was a norm in ancient Greece to accept electrum coins at a pre-specified value. And if a person were to try to buy something with electrum only to be turned down, he may have simply moved on to another person who did accept electrum. As has already been mentioned, it is unlikely that the coins were purely fiduciary: government power was not enough to force people to accept the coins at a stated value. In all likelihood, it was probably a combination of electrum’s perception as a separate metal, Lydian state power, social norms, and the fact that everyone knew that the coins contained precious metals that allowed all electrum coins of a certain weight and stamp to be accepted at the same value.

At this point, since we know that the metallic content of electrum coins could be artificially manipulated, it will be helpful to analyze a data set to see whether there is a pattern in the amount of gold in electrum coins over time. This will be done in the next chapter. If there is some kind of predictable fluctuation, we will try to find the cause. For example, one possible

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\(^{63}\) Mundell “The Birth of Coinage” 29.
explanation for any potential fluctuation in metallic content may be that whenever the value of
gold relative to silver increased, the amount of gold in the coins fell and vice versa.

Chapter 4: An analysis of Bodenstedt’s “Die Legierungen des Elektron”

In a chapter titled “Die Legierungen des Elektron” (“The Alloy Mixtures of Electrum”),
German numismatist Friedrich Bodenstedt organizes electrum data that comes from multiple
geographic locations. In particular, he takes electrum coins from Phocaea, Mytilene, and Kyzikos
and compiles metallurgical information about them. With the greatest accuracy possible,
Bodenstedt orders the coins chronologically by region and notes the percentage of gold within
each coin. Before delving into some analysis of these coins, it is important to realize that, while
these coins are different from the ones examined up until this point in this thesis, one can still
draw useful conclusions from them about the origin of coinage. Not only do the earliest of these
coins come not too long after the first electrum coins were struck in Lydia, but they are made
from the same material and in a similar way. As a result, if we can see some kind of pattern over
time within the coins in Bodenstedt’s study, we can use this information to add to the store of
knowledge that already exists about the origin of history’s first coins.

Following this paragraph there is a graph of electrum coins from the ancient Ionian city
of Phocaea. The x-axis represents time while the y-axis is the percentage of gold found within
each individual coin. All of the coins labeled “1” were struck somewhere in between 600 and
522 B.C. Those labeled “2” were made between 521 and 478 B.C. The ones labeled 3, 4, 5 and 6
were all made in the years between 477 and 326 B.C. While it is unclear exactly where each of
these later groups of coins falls within the 477-326 date range, we can be confident in knowing
that the coins in the third group were made before those in the fourth. Furthermore, the ones in
the fourth were struck before the fifth and the ones of the fifth were, in turn, made before those in the sixth.

Looking at the graph, it seems that the general pattern is that, as time went on, the percentage of gold in a particular electrum coin decreased. Although this pattern is not as pronounced in the fourth, fifth or sixth periods, there was a clear fall in the amount of gold, on average, in the first three periods. So much, in fact, that no coin had as much gold content in any successive period as the coin with the least amount of gold in the first period.

In order to examine further the metallic content of the coinage, the same coins from Phocaea are graphed two more times (shown below). In each, the measure of time on the x-axis is the same as before. However, instead of the percentage composition of gold, the y-axis now measures the percentage composition of silver and copper, respectively. Looking at these new graphs closely, we can see that while there was a noticeable increase in both the amount of silver
and copper used in the production of the coins as time went on—as indicated by the positive trend lines—the rate of increase in the percentage of silver was much larger than that of copper. The trend line on the silver graph has a coefficient on the x variable that is 1.6431. This means that for every additional unit of “time,” the percentage of silver in the coin increased by about 1.64 percent. A quick look at the graph of copper reveals that the coefficient on the x variable is only .76. Thus, when the amount of gold in the electrum coins decreased, most of it was replaced with silver, not copper. This supports the hypothesis that, over time, gold increased in value relative to silver. As this happened, the producers of electrum coins had a reason to keep a larger amount of the valuable gold for themselves as they produced electrum coins. The incentive to accumulate more gold came from the fact that gold appreciated in value: the longer one held gold in ancient society, the more it was worth, at least in comparison to silver.
Electrum Coins form Phocaea

% of Cu vs Time

Electrum Coins form Phocaea

% of Ag vs Time
Since Bodenstedt supplies data for two more Greek electrum mints, it will be helpful to see if the same pattern holds with different samples of electrum coins. If it does, then we will have even more reason to believe that the makers of electrum coins had a logical reason in altering the metallic composition of their coins. If such a reason does not exist, then we will expect to find a random distribution of gold in electrum coins, where the amount of gold in the coins is unpredictable with time.

As with the other graphs in this thesis, the methodology used for the next one is the same. However, there are a couple of differences. Whereas before x-axis was broken down into six segments, this time there are nine. The reason for this is because Bodenstedt organizes the data into groups. Although he tries to list the coins within a particular group in chronological order, he is not as confident in the exact position of the coins within a group as he is regarding the position of one group relative to another. As a result, the graphs treat all coins in one group as though they are minted at the same time, and so it is the relative positions of the groups themselves that indicate differences in time. More specifically, the coins in the first group, which are from the ancient city Mytilene on Lesbos, were originally minted in the years 521-487 B.C. All of the other groups--the ones labeled as two to nine--were made from 477 to 326 B.C. And just like before, while we may not know exactly when, for example, the fifth group of coins is produced, we do know that it is sometime after the fourth group but before the sixth.
Looking at the graph, there is a slight negative relationship between the amount of gold in the coins and time. This means that, as time went on in Mytilene, the electrum coins had a metallic content that contained less and less gold. This time, however, the relationship is not as pronounced. Whereas in the first graph of this chapter there is a trend line with a slope of -2.45, the trend line in this graph has a slope of only -0.27. Since this relationship is not as strong, it will be helpful to look at electrum coins from one more region from the Bodenstedt data before drawing any conclusions.

Below, there is a graph of electrum coins from the region of Kyzikos. As before, the methodology to make the graph is the same. The x-axis has the time while the y-axis has the percentage amount of gold. The coins in the “1” group on the x-axis are from 600-525 BC and the ones in the “2” group are from 525-410 BC. Unfortunately, while there is a negative relationship, it is not very pronounced. In addition, there are only eight coins in the graph.
Because the sample size is so small, we should be hesitant to use this data to support any sweeping conclusion about the history of electrum coins.

Looking at the Bodenstedt data, it seems that there may have been a slight negative relationship in electrum coins between gold and time. A possible explanation for this is that, as the archaic age advanced, gold in ancient Greece became worth more relative to silver. As a result, the mints in ancient Greece could have saved more of the valuable gold for themselves as they diluted the electrum bullion when they minted the coins. However, because some of the results are not as conclusive, in order to come to a more precise conclusion, it would be best to do more research in this area in the future.
Conclusion

Upon initial examination, it was clear that electrum currency possessed certain unique characteristics that puzzled many modern scholars. The ancient mints expended a great amount of effort to make electrum coins that were precisely standardized by weight. At the same time, because the coins consisted of an artificial alloy of gold, silver and copper, it was evident that, despite their efforts at uniformity, the coins from the same issue and stamp still differed in value from one another. One of the ways in which we saw scholars explain this phenomenon was to claim that the ancient Greeks were either not aware or did not care about the varying amount of precious metal within electrum. This, however, turned out to not be likely. First, we discovered that through the use of touchstones, people living in the ancient society had a method to determine the amount of gold within a particular electrum coin.

Second, there was no substantial evidence to lead one to believe that the amount of gold was irrelevant to the people in possession of electrum. Some historians noted that there might have been a possibility that electrum coins acted as fiduciary money where the coinage attained its worth solely from the stamp of the issuer of the coin. However, as Schaps explains, “it is reasonable to presume that the first coins were produced not as tokens [or fiduciary money] but as pieces of bullion of guaranteed weight and fineness.”64 Moreover, there is evidence to support that people cared about the fineness of metals even before the invention of coinage. As early as 710 B.C. in Assyria, for example, a certain type of silver known as “of Ishtar or Arbela” circulated as a more valuable metal when compared to other types of silver.65

64 Schaps The Invention of Coinage 30.

After careful analysis of a couple of other theories, we came to the conclusion that electrum coins were minted as a benefit to the issuers of the coinage. Because they produced coins made from an artificial electrum that contained less gold than the bullion from which they were created, the issuers accrued gold with each issue. We also learned that this did not imply that the consumers of electrum lost value in their assets as they traded their bullion in exchange for coins. As the coins were standardized by weight and with a stamp, they most likely gained in value, leading to a greater purchasing power.

In the last chapter of the thesis, we tested a hypothesis that could provide important, new information about the origin of coinage. More specifically, since the issuers of electrum could manipulate the amount of gold in electrum coinage, we wondered if it could be the case that, over time, the amount of gold in the coinage decreased. As Figueira pointed out, due to advances in mining, it seemed that, as the archaic age progressed, the value of gold increased relative to silver. As this happened, in order to profit from the increased worth of gold, perhaps it was the case that the issuers of electrum decreased the amount of gold in electrum coinage, keeping it for themselves. Looking at the data, which was taken from Bodenstedt’s “The Alloy Mixtures of Electrum,” there was reason to believe that the hypothesis was correct. Especially when looking at electrum coins from Phocaea, there seemed to be a significant negative relationship between the amount of gold in the coins and time. However, when we looked at more data, the results proved to be less conclusive. We then concluded that whether or not the hypothesis was right, there was definitely a potential to do more research in this area in the future.

In the end, it seems that perhaps the greatest knowledge that can be gained is the realization of just how little we know about one of history’s most important inventions. As Figueira writes at the end of The Power of Money, “It is uncertain whether it was someone
endowed with political authority acting on behalf of his community or an individual acting on his own behalf who conceived of the idea of coinage.”

Thus, similar to what other such as Schaps have pointed out earlier, there seem to be a myriad of things about the origin of coinage that we still do not know, and most likely will never know. Even basic things like on whose behalf the entity which invented coinage was acting. Nevertheless, as we continue to conduct research in this area, and as advances in technology help to elucidate certain ambiguities, we can add valuable information to the available knowledge about electrum coinage. Not only will this allow us to learn more about an important invention and the history of archaic Greece, but, more generally, we will also learn a great deal about human nature in seeing how such an invention was able to develop and have an enormous an impact on so many future societies.

66 Figueira, Power of Money 540.
Bibliography


