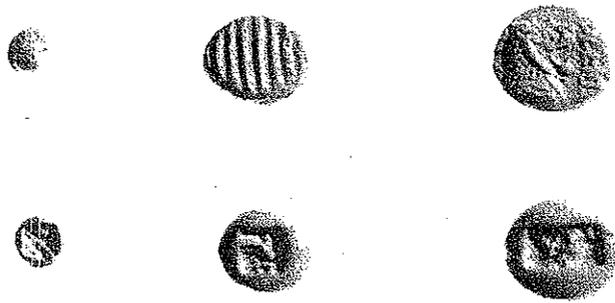


*Proto-Forms*

We are constantly involved in monetary transactions, yet we hardly ever notice the media we use in such transactions. And we should not notice them, either, since otherwise our trust in their independent functioning would be undermined. Observing the early period in the evolution of the monetary medium allows us at least to obtain a certain distance from our own communication environment. In observing the preserved coin forms of the ancient monetary medium we gain a sense of how arduously and slowly communication regarding economic values spread and solidified. Material forms of money have the advantage that they can be easily, that is, visually, observed. Whenever we speak of the "coin form" or "the form of the coin" hereafter, this notion is meant to encompass three different distinctions: First, it signifies the quite obvious delimitation of a form from its material environment. In this environment the form becomes cognitively, that is, psychologically and physically, observable for human eyes and hands. Second, the term refers to what is signified by a monetary sign, that is, value. When coins are used, this value is at once generated and passed on. And third, the "form of the coin" denotes the communication of payment that is structured by this form, because only in the structured form does the medium become observable.<sup>1</sup>

Numismatists and archeologists concur that in the course of the seventh century B.C. the Mediterranean civilization started to use precious-metal coins to make payments. By using available archeological and literary sources, we will follow this development until the emergence of the Athenian "owl coin" in approximately 500 B.C. In order to recognize the changes in form more readily, we shall divide our account of this process into a sequence of five basic forms.

During the 500 years prior to the emergence of coin objects, bean-



From left to right:

Form 1: Ionia, electrum,  $\frac{1}{48}$  stater, ca. 650 B.C.

Form 2: Ionia, electrum,  $\frac{1}{4}$  stater, ca. 650 B.C.

Form 3: Lydia, electrum,  $\frac{1}{6}$  stater, ca. 600 B.C.



From left to right:

Form 4: Aegina, silver, didrachm, 550 B.C.

Form 5: Athens, silver, tetradrachm, 520 B.C.

Source: Colin M. Kraay, *Archaic and Classical Greek Coins* (London, 1976), figs. 50, 51, 63, 114, 175.

shaped nuggets made of silver, electrum, and gold were in use in the Eastern Mediterranean region.<sup>2</sup> The production technique consisted in melting metal pieces of the desired weight and then flattening them. In their sizes, these so-called *phthoides* corresponded quite accurately to the units of weight employed in each of the local measuring systems.

The discovered *phthoides* have weights ranging from 20 grams down to 0.13 grams. Even the smaller pieces had enormous purchasing power. One could use them to buy a goat, a slave, or the yearly services of a mercenary.<sup>3</sup> Larger pieces were used exclusively in long-distance trade. For example, among the dozens of value-measuring instruments used in Mesopotamian societies, larger *phthoides* played a significant role in balancing the values of goods agreed upon in the exchange.<sup>4</sup> This practice of payment remained stable until about 700 B.C. Subsequently, punchmarks appeared on some nuggets. (See form 1 in the illustrations.)

The punchmarks are signs—but signs of what? The discussion about the meaning of the marks has a long and controversial history. The most prevalent opinion today among numismatists is summarized in the following quotation: “The merchant’s mark was often no more than the end of a particular broken iron nail hammered into the metal, but it could be readily identified by the man whose mark it was. This eliminated the necessity for the weighing and testing for purity of each piece of the precious metal every time it passed through the merchant’s hands; he knew his mark.”<sup>5</sup>

The above quotation highlights the significance of *recognition*. The mark communicates a quality of the materials thus signified. This is achieved by a combination of two factors: the physical change the hammering left behind and the similarity to signs already in use. The continuity of the assessment of this quality is assured by the limitation of the assessment to a single dimension within which person and locale remain the same. Only in the memory of the evaluator does a comparison of his observations of the objects at two points in time occur. In this way signs can emerge: as perceptions within memory, as signs for one’s own observation. The “sign in and of itself,” however, can also be noticed by other observers, namely as a *Versprechen* (promise; slip of the tongue) of validity transcending the present moment.<sup>6</sup> The one who marked the metal piece is inside. One can attribute to him a *Versprechen* if one is positioned within the engraver’s environment.

In this context of gradually evolving possibilities for expressing recognition and *Versprechen*, payments in the engraver's household and his immediate surroundings could occur faster and more frequently than they could with unmarked metal nuggets.<sup>7</sup>

In assuming that the "engraver's household" was the relevant form of agency at that time, I have in mind the organizational form of the *oikos*, that is, a community of several dozens or even hundreds of people living together. To what extent did payments play a role within archaic royal and merchant households? Internal relationships were familial or political. Yet on the household's periphery, exchange was unavoidable. The *oikos* was surrounded by workers and soldiers offering their services in exchange for food and money, and by merchants who supplied goods not produced by the *oikos* itself. At this periphery, marked *phthoides* started to circulate faster than the unmarked pieces.

#### *The Selection of the Form*

The next form appeared sometime around 670 B.C.<sup>8</sup> and can only be found on electrum pieces from the region between Sardis and the Ionian coast of Asia Minor (see form 2 in the illustrations). These coins are named after their basic form, *quadratum incusum*. They are flattened, and on their reverse one or several markings are hammered, which have obviously lost their authenticating function. The markings are independent of each other, yet generated in one stroke.<sup>9</sup> The side that rested on the minting punch often shows irregular imprints caused by the anvil. On some pieces found at Sardis, the obverse shows regular striation (see form 2 in the illustrations). There might be a technical reason for the striation: it might have helped prevent the metal flan from slipping off the punch. Yet as in the case of the punchmarks, this structure, too, took on a communicative interpretation: the marks occupied the reverse of the piece while the striation covered the obverse.<sup>10</sup> Thereby the entire piece became perceivable as a structured form. This is the form that came to be called "coin." We must now clarify why the new form only appeared in electrum pieces and only in a small region around Sardis.

Sardis was the city where the trade route from Assyria to Greece branched off to the Ionian cities.<sup>11</sup> Sardis was thus located at the intersection of two completely different cultures. In the east, the Meso-

potamian state-societies continued to exist after the Assyrian conquest of 745 B.C. In the west, the migration of Ionians led to a chain of small settlements along the coast. The basic institutional structure of these settlements still resembled those of their rural ancestors. Accordingly, the communication of payment was different in each society. In Assyria gold and silver ingots, in addition to other materials, were used as media for the storage of value and for the balancing of exchange values. Moreover, gold and silver were the subject of detailed metaphysical discussions in which gold especially was granted a key role based on an analogy with the sun deity.<sup>12</sup>

The degree of the material's purity was kept constant, and the weight was measured with technically elaborate precision. As long as the parity between the value-measuring instruments remained unchanged, this method had the advantage that it could measure economic values consistently up to large value accumulations. However, the complicated measurement procedure restricted the use of these media (such as gold and silver ingots) to a small group of merchants, temples, and royal houses. The Assyrian social system did not have a generally accepted and understood monetary medium. Its fundamental guiding distinctions were still determined by deity and power.

Among the Ionians the situation was significantly simpler, and accordingly the requirements for the media of communication of payment were much less demanding. As in other primitive cultures, here cattle and certain implements were employed as means of payment. The implements always had a religious connotation. Spits, trivets, axes, and rings were part of sacrificial rituals in which they were "handed over" to the deity. What worked in relationships to supernatural powers was also considered trustworthy enough for exchanges between people. In addition, the implements were magically protected against unauthorized alteration by dint of their religious connotation.<sup>13</sup> The materials employed for the implements ranged from iron to copper and bronze, and even silver; gold was hardly ever used. Money in the form of implements had the advantage of being composed of single, discrete elements that were easily countable. The valuation, however, remained limited to the narrow confines of a particular tribe or a settlement. Those objects remained worthless for making tributes or trading in distant locales.

The striated electrum coins from Sardis could be used as a monetary

medium in both cultures because the pieces held two different meanings; they were interpreted as signified metal (with a shine of gold) in the east, and as metallic signs (with a shine of silver) in the west. The effect was quite literally unconscious. Only electrum, found naturally in the fluvial sand in the Sardis region, carried the meanings of both gold and silver. Moreover, only the closed form of the marked coin could at once be interpreted as a credit-worthy sign and as a credit-worthy object. The improbability that such a double ambiguity would occur is obvious.<sup>14</sup> As far as we know, this event did not recur in any other place at any other time.<sup>15</sup>

How did this new form of coin from Sardis change the credit-worthiness of payments? In several ways: The shape of the markings not only referred to the one who marked the coins but also related to the magic protection invoked by the act of sealing: One is not permitted to “open” this form. The form’s closure made alteration technically more difficult since the regularity of the pieces made them more recognizable. But above all it was the surplus of meaning resulting from the multiple interpretations of the new form that led to an immense expansion of the communication of payment. The monetary units were used by more economic participants in increasing numbers of transactions, and accordingly they circulated faster. Consequently, the money supply that issuers of the novel coinage had at their disposal increased.

If the resulting growth in buying power and financial strength was in fact so tremendous, then surely we should expect to find traces of it in historical accounts. And indeed this is the case. There are clear signs that in Lydia around 670 B.C. the financial strength of merchants rose so greatly that they were able to assume political power and thereby establish a new form of political rule: the *tyrannis*.<sup>16</sup>

Literary sources mention for the first time a “merchant king” by the name of Ardys during the period 766 to 730 B.C. He is said to have ousted the prior king with money he accumulated as a “landlord and coach builder.” Further power struggles ensued between feudal aristocracy and merchants who could suddenly afford mercenary troops. Finally, with Gyges reigning from 687 to 652 B.C., a form of rulership took hold that based its claim to power not on birthright but on money.<sup>17</sup> This astounding change in the balance of power within Lydian society thus occurred in the same time period in which the striated electrum coins first

appeared. The significance that theory has assigned to this coin form can thus be confirmed historically.

### *The Medium of Money and the Form of Power*

Gyges founded a new dynasty, the Mermnadae, which lasted until the defeat of the king Croesus by the Persians in 546 B.C. The consolidation of Croesus’s power and his legendary wealth, we can presume, resulted from Gyges’ turning the minting right into a state monopoly.<sup>18</sup> This step was associated with a new form (see form 3 in the illustrations): instead of the striation, an image of a lion’s head<sup>19</sup> was struck into the electrum flan; the reverse with its square marks, however, remained unchanged. The lion was the totem animal of Astarte, the highest Lydian deity. This image transferred a mighty, religiously coded message to the coinage.<sup>20</sup> The coining merchant who had seized public power was now able to use public images. Originating in religious discourse, the communicative form of the totem animal initially denoted the political system and subsequently served to secure the credibility of a given economic value. Credit-worthiness was thereby increased in several ways: all members of the political-religious community were familiar with the image; material alteration of the coinage took on high magical risk; and at the same time the royal household guaranteed that the circulating coins would be taken back.

It is not surprising that Gyges monopolized his discovery that political power multiplies miraculously from the purchasing power of coins. Such a restriction of competition, however, could only be established within one’s own sphere of influence. The cities within the domain of the Ionian settlements quickly imitated the new form—an electrum flan with totem animal (or totem body part) on the obverse, ornamental punchmarks on the reverse.<sup>21</sup> The first cities to do so were Miletus, Ephesus, Samos, and Phocaea, followed in a second wave by Smyrna, Chios, Cyzicus, and Lampsacus.<sup>22</sup> The minting right was usually held by the city government, yet private issues of coins also occurred.<sup>23</sup> Long-distance trading of standardized goods, intensified regional trade, and investments in agriculture and crafts became part of the economy via the new coins, meaning that they became the subject matter of the communication of payment.

It is important at this point in our historical reconstruction to empha-

size the slow pace at which the described changes of the electrum coinage took place. Roughly half a century lay between the emergence of the striated coins and the coins minted by the Ionian coastal cities.<sup>24</sup> The circulation radius was still small, and the relatively few, high-quality electrum pieces still constituted only a fraction of the economic transactions. A clear initial stabilization of the form had nevertheless taken place during this long period of time. By means of improbable ambiguities, and originally in closed trade circles, variations were infused into the code of payment. These variations changed the code and subsequently its phenotypical environment. And this process did not require a conscious decision on the part of its economic players.<sup>25</sup>

#### *Stabilization of the Form*

Decades after their introduction, the silver content of the Ionian coins had risen to almost a hundred percent. They were nevertheless traded nominally at the price of electrum.<sup>26</sup> The first definitely silver currency was minted around the year 600 B.C. on Aegina.<sup>27</sup> Since the Aeginetans were a clan of long-distance traders active in the eastern Mediterranean, it is likely that here, too, an ambiguous development occurred within a closed circle. The new coinage initially was by no means accepted among the various trading partners of the Aeginetans; the clan used it internally for exchange and storage of value, that is, members of the clan communicated with each other by means of the silver coinage.<sup>28</sup>

The pictorial form of the new coinage remained constant: on the obverse a turtle is imprinted—the heraldic animal of the Aeginetan Hera—and on the reverse there is a *quadratum incusum* that had finally become simply ornamental. The change to the next form (see form 4 in the illustrations) was limited to one single dimension, namely that of the coin's material. The lower material value of silver made it possible to mint fractional denominations. Therefore, for the first time, local trade became accessible to the new form of payment as well. Moreover, a weight system was employed for the first time in Aegina which was tailored to the peculiarities of the monetary code, especially to the value ratio between silver and gold.<sup>29</sup> The artificially created communicative qualities of the monetary medium had become more important than the naturally existing properties of the material itself. The material used, incidentally, was

no longer a local natural resource. Silver had to be imported from outside of Aegina before it could be minted.

At the beginning of the sixth century B.C., silver currencies with different systems of measurement spread across many Greek cities. But only around 520 B.C. did the general form emerge that would remain unchanged until modern times. The images once again shifted. The animal image moved from the obverse to the reverse. The punchmark, having been part of the coin sign for a century, degenerated into an insignificant ornament and subsequently disappeared. The obverse was now imprinted with a human head surrounded by the attributes of a Greek deity (see form 5 in the illustrations).<sup>30</sup>

Taking the example of the "owl coin," we can once again observe how slowly the form of the coin changed.<sup>31</sup> The first Athenian coins displayed about a dozen different obverse types. These types have usually been interpreted as heraldic symbols of the coin-minting families; for that reason they are called *Wappenmünzen* (heraldic coins). All variants, however, followed the Attic coin standard and exhibited the same, almost identical, marking on the reverse that identifies them clearly as Athenian coins. The coins were evidently used in the immediate vicinity of Athens for local and regional commodities. The sign on the obverse had become arbitrary and hence variable; the mark that guaranteed the weight was still part of the archaic-abstract sign of the reverse. This, however, allowed only for internal communication since only those who were familiar with the abstract sign could decipher it.

In the years around 520 B.C., an animal, initially a lion and then a bull's head, appeared for the first time *within* the incuse square on the reverse of an Athenian coin. Shortly thereafter, the tyrant Hias, son of the tyrant Pisistratus, "reformed" the Athenian currency by replacing the circulating coin variants with a single form.<sup>32</sup> At this point the reverse exhibits, still within the incuse square, a standing owl with an olive branch. The symbol of the owl, the totem animal of Athena, signified Athens for external observers as well.<sup>33</sup> The obverse showed Athena's head with a helmet. Athena was more than the patron deity of the city; for that the symbol of the owl would have sufficed. Her image is also a reference to the world of gods shared by the entire Greek cultural sphere. With respect to this part of the coin's form, observers from outside of Athens were thus included within the sphere of communication.

Roughly around 480 B.C., a small lunar crescent was added to the owl and a diadem of olive to Athena's head, "thus establishing designs which were to remain unchanged (apart from stylistic developments) throughout the fifth, fourth, and much of the third century."<sup>34</sup> Part of these "stylistic developments" are an increasing simplification of Athena's distinguishing features and the slow expansion of the reverse's incuse square beyond the coin's edge: The corners of the mark disappeared. The mark had become something taken for granted.

Hitherto the success of the owl coinage and its remarkable stability were attributed mainly to factors unrelated to payments. Athens had silver resources through tributary payments and the exploitation of the silver mines at Laurium. Moreover, documents such as a decree from 420 B.C. indicate that the city sought to assert her currency with power and violence vis-à-vis allies and those owing tribute. The arguments, however, remain unsatisfactory. Attempts to monopolize the money supply, such as the one mentioned above, were frequent, yet in each instance they were sustainable only for a short time. What is more significant is that Athens's demand for currency was seemingly independent of available silver reserves. Athens's "hunger for money" grew to the point that the treasure of the Delphic League was taken to Athens and struck into coins. It comprised 5,000 talents equaling 125 tons of silver or 7.5 million tetradrachms. Athens also regularly took in silver revenues of a similar amount. With the money supply thus generated, the construction project of the Acropolis could be financed. Thus it was not the trade volume of commodities that required the creation of a suitable means of payment. Rather, a means of payment could be stimulated by identifying a suitable external referent, for example, the construction project. As a result, this money, once brought into circulation, was then also available for the payment of common goods. A good deal of the minted coins left the circulation of the Athenian economy and became the means of exchange for the nondomestic economies from Asia Minor to Afghanistan. The popularity of the owl coinage was additionally supported by local imitations and by adaptations especially in the Persian sphere of influence.

Hippias's reform had effects that he as an observer could not have predicted. There is reason to believe that Athens's rise as the financial and trade center of the Greek world is at least partly due to the dynamics generated by the reproduction requirements of the new coin form. These in-

cluded the emergence of financial institutions that were novel enterprises specializing in exchanging and storing monetary forms. For the first time, a complex of institutions took shape within society's communication of payment which dealt solely with the reproduction of the monetary medium. The monetary economy, hitherto limited to special circles and a few cities, spread quickly;<sup>35</sup> minting sites emerged all over Greece.<sup>36</sup> A new epoch in the evolution of European history began.

### *Unresolved Issues*

With our observations of Athenian coinage, we have entered our own cultural space and thus more familiar territory. In the previous section it was unnecessary to explain what the "construction project of the Acropolis" referred to. We also have reached the limit of questions that can be answered with existing source materials. Beyond this boundary, that is, outside of the coin form, questions arise that in the context of our investigation can only be illuminated tentatively.

What is especially striking is a peculiar oscillation of the signs' referentiality in the evolution of coins. On the one hand, such signs refer to private use that becomes credible externally, that is, in communication with other closed systems. On the other, the signs refer to public use that is legitimized within the closed monetary system.<sup>37</sup> The evolution of the coin began with private signs (form 1 and form 2). These signs enabled payments outside of a credit community. The payments were used in turn for a few expensive consumer and investment goods, possibly also for services purchased from external sources.

The credibility of the marked nuggets arose mainly from their recognizability. The sphere of circulation around the minting household, though very small at first, grew rapidly when, with form 2, the previously discussed double ambiguity emerged. With form 3 the information content of the coin essentially shifted to the obverse, while the reverse with its marks preserved the continuity of the established use. At this time the obverse exhibited a public image—the totem animal. Here again an ambiguity proved of service: the religious and political meaning gained through the image was interpreted economically and thus excluded risks that could not previously be ruled out. But internal payments with the new coin form by no means penetrated the entire ongoing economy. The

coins were employed for new kinds of payments that arose out of communication with central ruling households, namely taxes, tributes, tariffs, and reimbursements for corresponding expenses of the ruler. Again, the payments occurred at the periphery, this time, however, on the inside of society. The dissemination of the new coin form in Ionian cities enabled in turn an increase of external trade. Although the nominal value of the coins began to diverge from their metallic value, the trust in their acceptance as a means of exchange had grown sufficiently to sustain their use as payment. In form 4, the Aeginetan currency, nothing but the chemical, metallic form of the coin changed. Still, it was this currency that succeeded in expanding the internal use of money, for the use of silver enabled the introduction of smaller denominations. That in turn led to the extension of the external use of the coinage in open trade of mass commodities.<sup>38</sup> Again, the new forms of payment occurred on the inside of communication systems that employed them. With form 5, however, the signs migrated once more. The symbol that was hitherto public now denoted a minting site, that is, a private organization external to the bearer. The public totem symbol was replaced by a deity interpreted as a human head. Thus religious and aesthetic artistry was employed anew to secure economic credibility. The new coinage was carried to the periphery of the Greek culture. It did not necessarily return to those who initially coined it, but circulated freely within an economic area that had become immensely wide and dense.

The coin form thus founded remained stable until modern times. The reasons for this stability are not clear. One hypothesis proposes that the nesting of forms prevented their dissolution: First, the use of precious metal delimits one (chemical) form from all others; second, images set the coin apart from all other material forms; and third, images of humanized deities distinguish cultural self-observation in the form of widely known gods from such self-observation rendered through local totemic forms. Another hypothesis suggests that form 5 succeeded in accommodating the oscillation between private and public markings in one form. The reference to the mint created credibility in that it connected the coin to an origin, that is, a private starting point of positing value; the reference to the entire culture created credibility by making the communicated value collectively understandable. Both factors—another ambiguity—were now united in one semiotic form. In the interplay between public mints and

private banks the coinage was established and disseminated. Only in this context did the value standard for different monetary forms (objects, accounting entries, and credit) become uniform.<sup>39</sup> This, of course, applied only to the Greek economy. In the surrounding societies, especially in the Persian empire, the use of coins remained limited to the trade in luxury goods; in the Roman communication of payment it became established only in the third century B.C. Moreover, not until the eighteenth century, when paper bills emerged, did a form of monetary exchange take root that was largely independent of political legitimization and material valuation.

Not only does the oscillation of the marks remain for the most part an unsolved matter, but the reasons for the periodic emergence of human heads with different meanings are also unclear. More than a hundred years prior to the Athena images there were human heads and busts on early Ionian coins. Presumably these images, like those of animals, are to be interpreted as "spirits" with local religious significance.<sup>40</sup> Thus the signified entities were essentially nonhuman, and their human form was rather a matter of chance. In the case of Athena and the other Olympic gods, however, matters changed; now the world of the gods was a meticulous representation of the human world. It is this cultural achievement that enabled the Greeks to articulate a closed yet highly differentiated understanding of the world. The ambiguity in the depiction of a head that is recognizably human yet interpreted as divine is precisely the paradox that closes off the cultural sphere observed in the Greek way. Two hundred years after the first owl coins, heads appeared that were perceived as human. The tradition started with the head of Alexander the Great. Very gradually the image of the ruler was uncoupled from the familiar representation of the divine Heracles.<sup>41</sup> Thus the beginnings were once more marked by an ambiguity, and the transition was as form-preserving as possible. That images of rulers were imprinted so late might have stemmed from the inhibition to do so. It is more likely that Alexander was the first ruler sufficiently popular and widely enough admired not only to compete with a Greek god but even to be venerated above the gods in some areas of his empire located outside the Greek cultural sphere. This then made the establishment of the new monetary form possible.<sup>42</sup>

We now leave the observations that can be obtained from a historical perusal of the evolution of coinage. Before exiting the text altogether,

however, we shall consider the methodological consequences for observing the contemporary economy and its monetary medium. Today we are just as bound to the forms of the utilized media of payments as was the case at the time of the Lydian merchant households. We trust bank notes, credit cards, and special drawing rights, just as the traders trusted the marked *phthoides*. However, we cannot observe the forms of the structures of expectation since we ourselves as addressees are part of the network. With respect to coins we had the advantage of observing communication of payments via material forms. In the contemporary communication of payment, material forms have largely become irrelevant:<sup>43</sup> the creation of money has become more and more the pure creation of credit by a complex organization, that is, the network of financial institutions.<sup>44</sup> Instead, we have today a different source for observation available: We can register and reconstruct the paths that communication of payments takes. "Being a financial institution" is not necessarily bound to a particular type of organization. Insurance companies, pension funds, and all enterprises big enough to format flows of payments by themselves are part of the communication between financial institutions. The monetary medium is reproduced today by a multitude of organizations. The oscillation between private sites of money creation and trust in a public (societal) monetary community<sup>45</sup> symbolized by central banks still occurs. But it does so in a very complex structure, a fact we can only briefly mention here.

This perspective allows us to pose new questions about what can be taken for granted in today's economy and its monetary medium. We have only to interpret observed semiotic events as autonomous observations that of necessity relate to both previous and future observations. This applies equally to both economic and scientific observations of the reproduction of observations. Subject and object have disappeared; they are dissolved in the distinction between the communication game called society on the one hand and its environment on the other.

selves, so to speak, in the process of mediation so that we believe that we hear the ticking directly. In this case we are ordinarily not aware that mediation exists. The mediation of light waves is of the same nature. We do not perceive light waves as things that touch our eyes and refer to something else. We seem to see the mediated object directly" (p. 2).

76. "Yet at whatever time and in whatever way we speak a language, language itself never has the floor." Martin Heidegger, *On the Way to Language*, trans. Peter D. Hertz (New York, 1971), p. 59.

77. See, for example, Niklas Luhmann, "The Form of Writing," *Stanford Literature Review* 9 (1992): 2-42.

78. Luhmann, "Das Medium der Kunst," p. 6.

79. *Ibid.*

80. This does not change the fact that every form performs a selection: There are fewer phonemes than there are words, yet the number of possible combinations of phonemes is higher than the number of words in a particular language.

81. See Niklas Luhmann, "Sozialisation und Erziehung," in W. Rothaus, ed., *Erziehung und Therapie in systemischer Sicht* (Dortmund, 1987), pp. 77-86; and Niklas Luhmann, "How Can the Mind Participate in Communication," in Hans Ulrich Gumbrecht and K. Ludwig Pfeiffer, eds., *Materialities of Communication*, trans. William Whobrey (Stanford, Calif., 1994), pp. 371-87.

82. Luis J. Prieto, *Messages et signaux* (Paris, 1966), p. 117.

#### Baecker, *The Form Game*

1. Italo Calvino, *Six Memos for the Next Millennium: The Charles Eliot Norton Lectures* 1985-86, trans. Patrick Creagh (New York, 1993), p. 57.

2. George Spencer Brown, *Laus of Form* (London, 1969). Page references to this edition will be included in my text.

3. Heinz von Foerster, "Objects: Tokens for (Eigen-)Behaviors," in his *Observing Systems* (Seaside, Calif., 1981), p. 273; Niklas Luhmann, "Identität—Was oder wie?" in his *Soziologische Aufklärung 5: Konstruktivistische Perspektiven* (Opladen, 1990), pp. 14-30.

4. Matthias Varga von Kibéd, "Wittgenstein und Spencer-Brown," in Paul Weingartner and Gerhard Schurz, eds., *Philosophie der Naturwissenschaften: Akten des 13. Internationalen Wittgenstein Symposiums* (Vienna, 1989), pp. 402-6, quotation from p. 406.

5. Francisco J. Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind: Cognitive Science and Human Experience* (Cambridge, Mass., 1991), pp. 59-63 and 219-26; Carlos Castaneda, *Journey to Ixtlan: The Lessons of Don Juan* (Harmondsworth, Eng., 1973).

6. Jacques Lacan, "Subversion du sujet et dialectique du désir dans l'inconscient freudien," in his *Écrits II* (Paris, 1971), pp. 151-91, quotation from p. 161.

7. Talcott Parsons et al., "Some Fundamental Categories of the Theory of Ac-

tion: A General Statement," in Talcott Parsons and Edward A. Shils, eds., *Toward a General Theory of Action* (Cambridge, Mass., 1951), pp. 1-29, quotation from pp. 15-16.

8. Niklas Luhmann, *Social Systems*, trans. John Bednarz, Jr., with Dick Baecker (Stanford, Calif., 1995), pp. 104-5.

9. Niklas Luhmann, "Operational Closure and Structural Coupling: The Differentiation of the Legal System," *Cardozo Law Review* 13 (1992): 1419-41, quotation from p. 1423.

10. Luhmann, *Social Systems*, p. 106.

11. Johan Huizinga, *Homo Ludens: A Study of the Play-Element in Culture*, trans. R. F. C. Hull (Boston, 1955); Roger Caillois, *Man, Play, and Games*, trans. Meyer Barash (New York, 1961); Eugen Fink, *Spiel als Weltsymbol* (Stuttgart, 1960); Hans-Georg Gadamer, *Truth and Method*, 2d rev. ed., trans. Joel Weinsheimer and Donald G. Marshall (New York, 1989), pp. 101-34; Jacques Derrida, "Structure, Sign, and Play in the Discourse of the Human Sciences," in his *Writing and Difference*, trans. Allan Bass (Chicago, 1978), pp. 278-93; Keiji Nishitani, *Religion and Nothingness*, trans. Jan Van Bragt (Berkeley, Calif., 1982), pp. 218-85.

12. Ludwig Wittgenstein, *Philosophical Investigations*, trans. G. E. M. Anscombe, 3d ed. (Englewood Cliffs, N.J., 1958), §7 (p. 50).

13. *Ibid.*, §31 (p. 150).

14. Oskar Morgenstern, "Die Theorie der Spiele und des wirtschaftlichen Verhaltens," *Jahrbuch für Sozialwissenschaft* 1 (1950): 113-39.

15. John von Neumann and Oskar Morgenstern, *Theory of Games and Economic Behavior* (Princeton, N.J., 1953), p. 49.

16. Stephen Miller, "Ends, Means, and Galumphing: Some Leitmotifs of Play," *American Anthropologist* 75 (1973): 87-98.

17. Gregory Bateson, *Mind and Nature: A Necessary Unity* (New York, 1979), p. 139.

18. Gregory Bateson, "The Message 'This Is a Play,'" in Bertram Schaffner, ed., *Group Processes: Transactions of the Second Conference* (New York, 1956), pp. 145-242, quotations from pp. 148 and 150.

19. Gregory Bateson, "A Theory of Play and Fantasy," in his *Steps to an Ecology of Mind: Collected Essays on Anthropology, Psychiatry, Evolution, and Epistemology* (New York, 1972), pp. 177-200.

20. Bateson, *Steps to an Ecology of the Mind*, p. 185.

21. Fink, *Spiel als Weltsymbol*, p. 78.

22. Bateson, *Steps to an Ecology of the Mind*, pp. 179-81.

23. Huizinga, *Homo Ludens*, pp. 7-18, especially p. 13.

#### Hutter, *The Early Form of Money*

1. Note that I am here conceiving of payments as forms integrated into the

monetary medium. This diverges from the opinion that takes prices to be such forms within the monetary system. See Niklas Luhmann, "Das Moderne der modernen Gesellschaft," in Wolfgang Zapf, ed., *Die Modernisierung moderner Gesellschaften: Verhandlungen des 25. Deutschen Soziologentages in Frankfurt am Main 1990* (Frankfurt a.M., 1991), pp. 87–108, quotation from p. 99. However, prices are only signals of expectations by participants in the economy. Only in payments are prices actualized and thereby reproduced in the system.

2. See M. Ernest Babelon, *Les origines de la monnaie* (Paris, 1897), p. 106; and Miriam S. Balmuth, "Origins of Coinage," in *A Survey of Numismatic Research 1966–1971* (New York, 1973), pp. 27–34, especially pp. 30–31. Electrum, also known as "white gold," is a naturally occurring alloy of gold and silver. From a semiotic point of view, the use of metals is in itself a remarkable phenomenon. Signs are not created arbitrarily; they are not introduced into a free space. They are distinguished within an already existing environment that seems to be "close-packed," thus completely occupied by other signs. This means in the case of metals that the semiotic quality of specific metals is only established in a slow process alongside their material property. And the issue is always meanings addressed to an "other," be it a deity to whom one brings a sacrifice or a person for whom one adorns oneself.

3. See Colin M. Kraay, *Archaic and Classical Greek Coins* (London, 1976), p. 28.

4. See Fritz Heichelheim, *Wirtschaftsgeschichte des Altertums* (Leiden, 1938), and Fritz Heichelheim, "Geld- und Münzgeschichte I: Anfänge und Antike," in *Handwörterbuch der Sozialwissenschaften* (Tübingen, 1965).

5. Norman Davis, *Greek Coins and Cities* (London, 1961), p. 21.

6. The ambiguity of the German word *Versprechen* encapsulates the ambiguity of the observation. In one sense of *Versprechen*, someone promises an event that lies in the future. Current events are thus connected to future events, which have not yet happened. Though they are invented, they are possible according to the logic of the communication of payment. In the other sense of *Versprechen*, someone mistakenly attributes an observation to an earlier event that never happened. Hence he invents past events, which can then lead to a future consistent with those events. The triggering moment, however, can also lie with the one who offers the sign: he makes a mistake, he makes a slip of tongue, and yet the sign is accepted because the receiver does not perceive it as a mistake but contrives a suitable meaning.

7. It is interesting to note that the varying metallic content of electrum was of great importance even as early as the punchmarked coins. Accordingly, the punchmarks occurred predominantly on electrum pieces.

8. On dating issues, see below, note 24.

9. This is evidenced by the lack of traces of two hammering operations, which would be visible on the other side of the coin. See Lieselotte Weidauer, *Probleme der frühen Elektronprägung* (Fribourg, 1975).

10. The numismatic discourse usually refers to the side that rests on top of the anvil as the coin's obverse. This is certainly justified once this side is imprinted with images and hence becomes the more significant side of the coin. Regarding the pieces considered here, however, the reverse was probably still the more important side and thus functioned like the image-bearing obverse of later coins.

11. See Heichelheim, *Wirtschaftsgeschichte des Altertums*.

12. See Bernhard Laum, *Heiliges Geld* (Tübingen, 1924). From a systems-theoretical viewpoint it is worth noting that the distinction between gold and silver can provide a material analogy for the distinction between day and night. What is decisive here is the excluded third, that is, the world beyond the visible world of day and night. This fundamental closure can be represented by gold and silver. In my view, another property of metals carries communicative meaning as well: their reflectiveness. Metals throw back the images of the external world and thereby point to the fact that behind their surface another world begins.

13. See especially the account in Laum, *Heiliges Geld*.

14. It suffices to point out that, apart from the Pactolus River near Sardis, electrum from fluvial sand has only been discovered thus far at three other sites on the globe. See Balmuth, "Origins of Coinage," p. 31.

15. Sources on the non-European history of money are scarce. However, it appears that India's autochthonous monetary evolution never went beyond the form of marked metal pieces (i.e., form 1). See Bernhard Laum, "Münzwesen," in *Handwörterbuch der Sozialwissenschaften* (Jena, 1925); Pran Nath, *Tausch und Geld in Altindien* (Leipzig, 1924); and Babelon, *Origines de la monnaie*. The Chinese communication of payment up to the modern era also used precious-metal coins only occasionally. See Lien-Sheng Yang, *Money and Credit in China: A Short History* (Cambridge, Mass., 1952).

16. "It was the monopoly in stamped pieces of electrum that brought the first tyrant to the king's palace and placed him on the throne." Peter N. Ure, *The Origin of Tyranny* (Cambridge, Eng., 1922), p. 152. Ure's study gives the most detailed account of the historical episode we are presenting here. Although not all of his dates are still tenable today, the order of key events that he established does concur with our chronology of coin forms.

17. The notion of "tyranny" originally meant nothing more than the exercise of power by a ruler who is not legitimized transcendently but in effect biologically. Only much later does this term take on the connotation of cruel and unjust rule.

18. See Ure, *Origin of Tyranny*, p. 143. Kraay, in *Archaic and Classical Greek Coins*, suggests that pictorial signs were initially related to the person in power, which meant that they had to be restruck when power changed hands.

19. The temporal priority of the lion's head over all other signs, however, is not completely evidenced by archeological findings. It is also conceivable that private houses experimented with pictorial signs. The religious connotation of the

emblem, however, constitutes the evolutionary difference. See Weidauer, *Probleme der frühen Elektronprägung*.

20. "The totem (consisting of animals, plants, implements, weapons) is the outward expression of a 'mystic participation' . . . ; he who carries the totemic symbol stands in magic communion with the totemic community; the symbol is a sanctioning of tribal membership." Laum, *Heiliges Geld*, p. 140.

21. It is remarkable that in this early phase written signs did not play any role. Though their use in marking goods had been established for a long time, their readability was far lower than that of pictorial signs. See Denise Schmandt-Besserath, "An Ancient Token System: The Precursor to Numerals and Writing," *Archaeology* 39 (1986): 32-39.

22. See Fritz Heichelheim, "Die Ausbreitung der Münzgeldwirtschaft und der Wirtschaftsstil im archaischen Griechenland," *Schmollers Jahrbuch* (1931): 37-62, quotation from pp. 42-43.

23. The effect of the fluctuating metallic content of the electrum coins is worth noting. While the weight of the discovered pieces remains constant within a 3 percent range, the gold content varies between 27 percent and 52 percent. See Kraay, *Archaic and Classical Greek Coins*, p. 28; and Josef Dobretsberger, "Vom Ursprung des Münzgeldes," *Finanzarchiv* (1961): 60-70, quotation from pp. 68-69.

Thus the stamping of the coin only guaranteed its weight. Since it became readily observable that the metallic content of the electrum pieces could change, the difference between signified value and signifying metal became apparent as well.

24. Archeological evidence figures, of course, as the prime source for dating coins. Interpretations are controversial, however. The key evidence is a single hoard left as a building sacrifice in the foundation of the Artemis temple at Ephesus and excavated in 1908. It contains 81 electrum coins, 9 "pre-coins," and several precious-metal objects. See Weidauer, *Probleme der frühen Elektronprägung*, and Kraay, *Archaic and Classical Greek Coins*. One of the coins carries an inscription that for a long time was attributed to the Lydian king Alyattes. Alyattes' rule began in 610 B.C. From the assumption that coins were used no longer than one generation, it was concluded that the earliest coins date to roughly 630 B.C. This line of reasoning goes back to E. S. G. Robinson, "The Date of the Earliest Coins," *Numismatic Chronicle and Journal of the Royal Numismatic Society* (1956): 1-8. By contrast, a more recent study—Weidauer, *Probleme der frühen Elektronprägung*—develops a different chronology, which we use in this text. The major arguments are the following: (1) It is improbable that the inscription can be positively linked to Alyattes; (2) there are Assyrian sources, composed no later than 626 B.C. given Ashurbanipal's death in that year, which report an attack on Ephesus by the Cimmerii in the course of which the Artemis temple was destroyed; (3) coins, and likewise the pre-coin objects, were in use much longer than one generation; (4) strong stylistic similarities can be demonstrated between art

objects from the first half of the seventh century and coin types, especially the lion heads.

25. This finding contradicts the interpretation of the emergence of coins common to the traditional theories of money. According to this understanding, coins once "invented" by a ruler's decree or by chance disseminate quickly in the economic sector since the benefits of this medium are supposed to be easily recognizable to the trading individuals.

26. This shows again the effect of the dissemination of money by means of signs: the coin value diverges from the material value, be it through counterfeit or certain reminting procedures. It is precisely "the false," that is to say, the deviation between the credibility of the material value and the face value of the coin sign, that makes it possible to trust in signs and thus to increase the amount of mintable coins.

27. According to a tradition that goes back to Herodotus, the introduction of silver currency is ascribed to King Pheidon of Argos. If this were true, the coinage would date to approximately 650 B.C. This, however, is not supported by existing coin findings. See Kraay, *Archaic and Classical Greek Coins*, pp. 41-42. Herodotus also reports that Pheidon confiscated the archaic spits that had been used as means of payment. Again, the deliberate act is probably a literary fiction. Yet it is nonetheless striking that money in the form of implements still was actively used in that era.

28. It is noteworthy that the Aeginetan rather than the Phoenician merchant clan succeeded in using coins in their trade with different societies. Even in this case, however, the coins were most likely employed for internal commerce among merchants. The initially conservative situation of the various people with whom the merchants traded, one can suspect, only allowed a slow penetration of the monetary code.

29. Given the value ratio 1 to 15, which remained stable over a long period of time, the Aeginetan drachma was calibrated in such a way that ten silver pieces equaled the value of one gold piece. See Ure, *Origin of Tyranny*, p. 172.

30. There was one transitional step in which both sides were stamped with animal images. Such coins appeared first in Corinth and subsequently in other cities as well. See Laum, "Münzwesen," p. 678.

31. The following account is primarily based on Kraay, *Archaic and Classical Greek Coins*.

32. Though the attribution to Hippias is controversial, Kraay puts forth convincing arguments.

33. Archaic owl coins were struck almost exclusively in tetradrachms, thus in large units of weight. They were discovered in coin finds between Sicily and Egypt.

34. Kraay, *Archaic and Classical Greek Coins*, p. 61.

35. See Heichelheim, "Die Ausbreitung der Münzgeldwirtschaft," p. 46. He speaks of a "sudden" expansion.

36. For the empire of Alexander the Great (i.e., around 330 B.C.), 162 minting sites and the production of 1.4 billion drachmae are reported. See Peter R. Franke and Max Hirmer, *Die griechische Münze* (Munich, 1972), p. 125.

37. Dirk Baecker especially experiments with this oscillation between private and public markings. See his works *Womit handeln Banken?* (Frankfurt, 1991) and "Die Metamorphosen des Geldes," *Delfin* 14 (1990): 17-26.

38. See C. H. V. Sutherland, "Corn and Coin: A Note on Greek Commercial Monopolies," *American Journal of Philology* 64 (1942): 129-47.

39. On the gradual merging of the concepts of interest on borrowed cattle, seeds, and metal see Heichelheim, *Wirtschaftsgeschichte des Altertums*, p. 224.

40. See Weidauer, *Probleme der frühen Elektronprägung*.

41. "On Alexander the Great's silver tetradrachm, the individual features of the king are inscribed into the head of the youthful Heracles adorned with the skin of the Nemean Lion. It cannot be ignored that the ambiguity of the images was indeed intended." Karl Christ, "Die Griechen und ihr Geld," *Saeculum* (1964): 214-29, quotation from pp. 221-22.

The chronology, however, is incomplete. Significantly earlier, heads of Persian satraps had already appeared on coins. They were modeled after Athena's head on the owl coin. See Kraay, *Probleme der frühen Elektronprägung*, and Franke and Hirmer, *Die griechische Münze*, p. 123. Yet it is true that those coin types were not part of a continuing tradition. From an evolutionary viewpoint, they remained irrelevant for the developments to follow.

42. "Back then, Alexander's silver currency ruled everywhere coins were minted under Greek influence, that is, from the Pillars of Hercules in the West to the Indus in the East. The Roman dinar seems to be the direct continuation of the Alexandrian drachma." Laum, "Münzwesen," p. 679.

43. It is, however, noteworthy that the change in the design of bank notes is frequently perceived as a transition to play money. In a new form the artificial nature of the value form is noticeable until habit blinds our view.

44. See Baecker, *Womit handeln Banken?* Crump's theory of money, though not based on a systems-theoretical approach, postulates in a similar vein a "pure money complex." See Thomas Crump, *The Phenomenon of Money* (London, 1981).

45. In *Womit handeln Banken?* Baecker speaks of an oscillation between loose and tight couplings within a network.

#### Stichweh, *The Form of the University*

1. Talcott Parsons and Gerald M. Platt, *The American University* (Cambridge, Mass., 1973).

2. Aside from the Catholic Church, the parliaments of the Isle of Man, Iceland, and Great Britain, the Monte Paschi di Siena, and approximately 70 universities, one can find hardly any organizations that have continuously existed

since 1520 or earlier. See Clark Kerr, "A Critical Age in the University World: Accumulated Heritage Versus Modern Imperative," *European Journal of Education* 22 (1987): 183-93. By analogy, the more than 350 years of Harvard College (founded 1636) is an unusually long period for the United States. For data, see Lubor Jilek, ed., *Historical Compendium of European Universities* (Geneva, 1984).

3. Regarding the logic of distinctions, see Francisco J. Varela, *Principles of Biological Autonomy* (New York, 1979), pp. 107-8; and Niklas Luhmann, "Wie lassen sich latente Strukturen beobachten?" in Paul Watzlawick and Peter Krieg, eds., *Das Auge des Betrachters: Beiträge zum Konstruktivismus* (Munich, 1991), pp. 61-74, especially pp. 63-65.

4. [*Fachhochschule* is a special institutional form within the German higher educational system that offers primarily vocational training (comparable to polytechnics and technical colleges) and does not award doctorates.—Trans.]

5. See Gillian Rosemary Evans, *Old Arts and New Theology: Beginnings of Theology as an Academic Discipline* (Oxford, 1980).

6. For instance, the observer might locate the overarching unity of the distinction between school and university in the fact that both are concerned with education in contrast to economic behavior or the recruitment of political loyalties.

7. See George Spencer Brown, *Laws of Form* (New York, 1972); Niklas Luhmann, "Frauen, Männer und George Spencer Brown," *Zeitschrift für Soziologie* 17 (1988): 47-71; Niklas Luhmann, Frederick D. Bunsen, and Dirk Baecker, *Unbeobachtbare Welt: Über Kunst und Architektur* (Bielefeld, 1990); Niklas Luhmann, *Die Wissenschaft der Gesellschaft* (Frankfurt a.M., 1990), especially pp. 75-87; Niklas Luhmann, "Der Gleichheitssatz als Norm und als Form," *Archiv für Rechts- und Sozialphilosophie* 77 (1991): 435-45; Niklas Luhmann, "Die Form 'Person,'" *Soziale Welt* 42 (1991): 166-75.

8. For a more detailed account, see Rudolf Stichweh, *Der frühmoderne Staat und die europäische Universität: Zur Interaktion von Politik und Erziehungssystem im Prozeß ihrer Ausdifferenzierung (16.-18. Jahrhundert)* (Frankfurt a.M., 1991), especially chap. 1.

9. See Friedrich Carl von Savigny, *System des heutigen römischen Rechts*, vol. 1 (Berlin, 1840).

10. *Akademische Gymnasien* only existed in early modern Germany. Unlike other *Gymnasien*, they not only imparted philosophical and artistic knowledge but also offered introductory courses in so-called "Faculty Studies" (e.g., law, theology). However, they were not allowed to confer degrees, nor did they enjoy "academic freedom," two characteristic privileges of universities.

11. Interesting in this context is Friedrich Carl von Savigny, *Juristische Methodenlehre* (1802/3), Jacob Grimm's edition (Stuttgart, 1951), p. 69.

12. Richard Mulcaster, *Positions Wherein Those Primitive Circumstances Be Examined, Which Are Necessarie for the Training up of Children, Either for Skill*

PROBLEMS OF FORM

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