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The divergent evolution of coinage in eastern and western Eurasia

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Abstract: This paper offers a concise comparative assessment of some key features of the 'Aegean' and 'Chinese' models of coinage.

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Money can take many forms, and has come into existence all over the world. Coinage,¹ by contrast, was independently created on no more than two occasions in history – in the Greco-Lyidian Aegean perhaps as early as the late seventh century BC, and in the Great Plain of China around two centuries later – and has consequently followed only two distinct trajectories. What I propose to call the ‘Aegean’ type of coinage was characterized by solid, round (albeit occasionally rectangular or oblong) objects endowed with varied visual imagery and manufactured from a number of different metals, most notably – in terms of aggregate value – gold and silver. Chinese coins, on the other hand, were cast rather than struck, equipped with a (usually square) hole in the center, lacked visual imagery beyond a few letters, and were not normally minted from precious metals: they consisted primarily of bronze (and sometimes iron), whereas gold and silver money circulated in the forms of ingots. In this paper, I offer a brief survey of divergent monetary development at the opposing ends of the Eurasian land mass, followed by some preliminary observations on the probable causes of this process that focus on the historically specific circumstances of the creation of these two types of currency.

The expansion of ‘Aegean’ coinage

From the beginning, western Eurasian or ‘Aegean’ coinage was based on precious metals, initially electrum, a naturally occurring gold-silver alloy that was soon largely replaced by separate gold and silver issues. Silver quickly became the dominant metal of the emerging ‘Aegean’ coinage system:² after its adoption by key poleis of the Aegean, such as Aegina, Corinth and Athens and various Ionian and Cycladic communities, silver coinage spread along the main axes of Greek overseas migration, into the Black Sea region in the early sixth century BC, to Sicily and southern Italy in the mid-sixth century BC, and to the coastal settlements in Cyrene, Spain and Provence. For a quarter of a millennium or so, production of Greek-style precious-metal coins was largely confined to Greek populations and those in close contact with them: from the late sixth century BC onward, Thracians and then Macedonians in the northern Aegean imitated the Greek format, followed by the Lycians in south-western Asia Minor. At roughly the same time, the Lydian variety of ‘Aegean’ coinage was adopted and modified by the Achaemenid

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¹ There is no obvious or universally accepted definition of ‘coin’. A coin may be described as money in the form of a small, mostly flat (but sometimes curved), usually (though not always) round, metal object that bears some kind of inscription or pictorial motif that has been uniformly applied to a series of such objects. (Modern definitions tend to stress the element of state authority, which must not be presumed for earlier periods.) The essence of ‘money’ is likewise difficult to pin down: it serves as a store and measure of wealth, a unit of account, and – arguably most importantly – as a medium of exchange.

² e.g. L. Weidauer, *Probleme der frühen Elektronprägung* (Fribourg, 1975); S. Karwiese, *Die Münzprägung von Ephesus, I* (Vienna, 1995). On pre-coin money, see J. Le Rider, *La naissance de la monnaie: pratiques monétaires de l’Orient ancien* (Paris, 2001). The most systematic survey of ancient coins is R. Göbl, *Antike Numismatik, I* (Munich, 1978), 57-130, on which much of this section is based.

empire, although coin use appears to have been relatively rare beyond its western (that is, Mediterranean) periphery. Persian silver coins were minted in the first instance in the period of conflict with the Greeks in the first half of the fifth century BC, and hoard finds are concentrated in Asia Minor. Gold issues did not take off until subsidies to Greek states commenced in the late fifth century BC and have predominantly been recovered from hoards in Greece, Cyprus, and Italy.³ It therefore seems that Achaemenid coinage was above all a functional extension of, and response to, Greek coinage. The same holds true for the satrapal issues in western Asia Minor that are more overtly dependent on Greek models, as well as for Carthage, which began to issue Greek-style silver coins at the end of the fifth century BC, initially outside Africa proper, in the context of large-scale warfare against the Sicilian Greeks.⁴

The volume and catchment area of ‘Aegean’ coinage increased dramatically with the conquests of Alexander the Great in the 330s and 320s BC. As the gold and silver bullion stocks of the Achaemenid court were minted out and put into circulation by Alexander and his warring lieutenants, Greek-style coin came to be produced in large quantities all over the former Persian empire, from Eastern Iran to Mesopotamia, Syria, and Egypt. Gold, temporarily important under Alexander, was once again eclipsed by silver under his successors. Under this influence, north-western India, which had previously begun to develop a – possibly though not necessarily indigenous – tradition of punch-marked silver bars and proto-coins, imported the ‘Aegean’ model, as did a series of foreign dynasties that successively controlled parts of Central Asia and northern India, from the Greco-Bactrian and Greco-Indian regimes (third to first centuries BC) to the Sakas and Pahlavas (first centuries BC and AD) and the Kushan (?first to third centuries AD). The Parthians, who wrested Iran and Mesopotamia from the Seleucids in the second century BC, likewise continued ‘Aegean’ monetary traditions with silver coins struck on the Attic standard. From the third through the seventh centuries AD, their regional successors, the Sasanid dynasty, continued to mint silver coins, supplemented by occasional gold issues. To the East, the Greco-Bactrian, Saka and Pahlavas issues were likewise dominated by silver. Gold assumed somewhat greater importance from the third century AD onward, in the late Kushan period and especially with the Kushano-Sasanid issues of the second half of the fourth century AD. The White Huns subsequently returned to silver coinage while the Gupta dynasty in India (fourth to eighth centuries AD) favored gold dinars.

In the west, the spread of Greek-style coins into the interior of Europe – among Celtic and Iberian groups – is difficult to date, although it appears that this process did not gain momentum until the second century BC, resulting in varied output in Spain, Gaul, the Alpine region and the Balkans, as well as in the southern half of Britain. Gold and silver issues co-existed and varied in relative prevalence depending on the local metal supply.

At the early stages of ‘Aegean’ coinage, small denominations were invariably expressed in fractional silver coins of frequently minuscule weight (down to 0.2g), which

³ I. Carradice, ‘The “regal” coinage of the Persian empire’, in I. Carradice (ed.), *Coinage and administration in the Athenian and Persian empires* (Oxford, 1987), 73-108.

⁴ See most recently I. Lee, ‘Entella: the silver coinage of the Campanian mercenaries and the site of the first Carthaginian mint 410-409 BC’, *NC* 160 (2000), 1-66.

were produced in what could be very large quantities and predominantly for local use.⁵ Fractional bronze coinage that combined low value with greater user-friendliness only appeared in the mid-to-late fifth century BC. Bronze gained greater importance in the Hellenistic successor states, especially in Ptolemaic Egypt. It played only a limited role in the Parthian empire but was more common among the Greco-Bactrians and in the early Sasanid period.

In Italy, the archaic tradition of producing heavy metal bars of bronze (from c200 to c400 grams) that was found among Etruscans, Samnites and in Rome was gradually superseded by the introduction of Greek-style silver coins. Within the territories under Roman control, this process commenced with the production of Campanian silver staters from the late fourth century BC onward, followed by the *quadrigatus* and *denarius* silver coins in the second half of the third century BC. Bronze money shrank to coin-sized items and was increasingly marginalized by silver: by the second century BC, bronze may not have accounted for more than 10-15% of the aggregate value of the Roman money stock.⁶ Roman expansion initiated a protracted process of monetary unification: the absorption and re-coining of much eastern Mediterranean silver in the first century BC and the concurrent demise of local precious-metal coinages in the western Mediterranean and its hinterlands; massive injections of coined gold from the mid-first century BC onward that created a trimetallic system of gold, silver and base metal coins, dominated – in terms of value – by gold and silver; the destruction of Greek-style provincial silver coinages in the eastern Mediterranean in the mid-third century AD; and repeated re-minting programs and standardized empire-wide re-issues of new formats since the early fourth century AD. Progressive debasement of the imperial silver currency in the third century AD created a de facto – and, from the 370s, formal – two-tier system of (stable) gold coin and (unstable) base metal coin, the latter subject to cyclical debasement and inflation. The late Roman gold standard survived in the Byzantine empire via the *solidus* and later the *hyperpyron*, complemented by bronze coins, all the way up to the fourteenth century.

Under late Roman and Sasanid influence, the kingdom of Axum in Ethiopia produced gold and silver coins from perhaps as early as the third century AD into the Middle Ages. Starting in the fifth century AD, imitations of Roman coins also appeared in the western parts of the disintegrated Roman empire, including silver and bronze coins of the Vandals (fifth/sixth centuries AD), gold, silver and bronze of the Ostrogoths (sixth century AD), mostly gold of the Visigoths (fifth to eighth centuries AD), the Suebians of Spain (fifth/sixth centuries AD), and the Lombards in Italy (since the late sixth century AD), while the Merovingian Franks shifted from gold to silver. From the eighth to the twelfth centuries, the latter was essentially the only metal used in western European minting. Gold coin returned in the thirteenth century and regular base-metal denominations in the fifteenth century, in both cases spurred by Italian pioneer issues. With European colonization, these extensions of the ‘Aegean’ currency tradition gradually spread all over the globe.

⁵ H. S. Kim, ‘Small change and the moneyed economy’, in P. Cartledge, E. E. Cohen, and L. Foxhall (eds.), *Money, labour and land: approaches to the economies of ancient Greece* (London and New York, 2002), 44-51.

⁶ K. W. Harl, *Coinage in the Roman economy, 300 B.C. to A.D. 700* (Baltimore and London, 1996), 47.

The creation and perpetuation of Chinese coinage

East Asia was the only exception. In the first millennium BC, China had developed a separate type of coinage that was characterized by the inclusion of a central hole in round coins (in China as well as in the secondary monetary traditions of Korea, Vietnam and Japan) and, more importantly, by the complete dominance of base-metal coins (a Chinese feature that was not always replicated by neighboring cultures). The whole region did not fully adopt ‘Aegean’ conventions until growing western influence and the introduction of foreign equipment facilitated the transition to solid coins in Japan (after the Meiji Restoration of 1867) and Korea (in the 1880s), and to solid as well as precious-metal coins in China (mostly in the late nineteenth century). The shunning of precious-metal coinage by successive Chinese dynasties over the course of more than 2,000 years marks out China as unique among all state-level societies that used coin, and raises two questions: Why did Chinese coinage develop differently from the ‘Aegean’ model, and why was its distinctive character maintained for a very long time even as economic circumstances changed and contact with ‘Aegean’ coin gradually intensified? These are complex problems that require much more detailed analysis than is possible here.

Historical overview

In pre-imperial China, money took the form of cowries shells, both originals and – increasingly – bronze imitations, tortoise shells, weighed gold and (rarely) silver bars, and most notably – from at least 1000 BC onward – utensil money in the shape of spade blades and knives made of bronze.⁷ Initially large and quasi-functional, utensil money gradually shrank in size and weight until monetary objects ranged from about 7 to 30 grams. Round coin appeared in the fourth century BC in the states of the central Great Plain, the economically most developed part of early China: likewise manufactured of bronze and endowed with (mostly square) holes, these objects may have been modeled on earlier similarly shaped but much more valuable jade disks, and were cast according to regional weight standards with a variety of legends but no pictures. With the kingdom of Qin’s conquest of the rival warring states in the 220s BC, the Qin *banliang* (i.e., ‘half-ounce’ [7.6g]) coin became the official standard throughout the region, at least in theory if not immediately in practice. This imperial bronze currency was supplemented by gold that circulated as bullion, a two-tier system that was retained by the early Han dynasty (from 206 BC onward) which relied on a combination of gold (weighed but only occasionally cast in units of 1 *jin* = 16 *liang*, or 244 grams) and increasingly underweight *banliang* coins. In the 110s BC, the reformist emperor Wu imposed a state monopoly on the production of bronze coins and replaced the (nominal) *banliang* issues with the *wuzhu*

⁷ X. Peng, *A monetary history of China, I-II* (Bellingham, 1994) is the most comprehensive study of Chinese monetary history. For the pre-imperial period, see Y.-C. Wang, *Early Chinese coinage* (New York, 1951) and now F. Thierry, *Monnaies chinoises, I: L’antiquité préimpériale*, (Paris 1997). K. Peng, ‘Coinage and commercial development in Eastern Zhou China’, Ph.D. thesis (University of Chicago, 2000) is the most sophisticated study of money in the Spring-and-Autumn and Warring States periods.

(‘five grains’) bronze coin of 3.2 grams. For more than three centuries, with only a brief interruption during the Wang Mang usurpation of AD 6-23, *wuzhu* coins were cast in very large quantities: a textual reference to the production of 28 billion coins within a little over 110 years implies a mean annual output of some 230 million coins (using 750 tons of bronze), which translates to 7 or 8 coins per second.⁸

Notwithstanding considerable weight debasement in the early Han period, the annalistic tradition suggests that – within certain margins of tolerance – the intrinsic (metal) value of coins was supposed to match their nominal value.⁹ A Qin law from the mid-third century BC that required subjects to accept ‘round coins’ at their face value regardless of their actual weight and sought to outlaw the weighing of coin for private transactions will best be taken to reflect metallistic preferences among civilians. This reading is supported by a Han memorial of 175 BC which observes that in market transactions, additional coins were added to compensate for underweight specimens: intrinsic value trumped nominal value.¹⁰ Furthermore, sporadic experimentation with strongly overvalued token coins under Wu and especially under Wang Mang reportedly triggered widespread resistance, counterfeiting, and probably price inflation.¹¹ The success of the *wuzhu* system for over three centuries of Han rule depended both on availability (i.e., massive output) and reliability (i.e., reasonably solid standards of weight and purity): in a pilot study of weighed *wuzhu* coins kept at the Département des Monnaies, Médailles et Antiques in Paris, I have been able to show that from the late second century BC to the late second century AD, the imperial mint consistently focused on the official target weight, and that variations from the mean averaged out in larger samples.¹² By contrast, renewed recourse to token coins in the third century AD quickly resulted in inflation and currency collapse.¹³

In keeping with earlier custom, Han gold circulated as ingots, often in the shape of (hollow) deer hoofs. Currently known from 26 findspots in 14 different provinces, these objects varied greatly in terms of weight as well as purity, and were frequently cut into pieces, presumably to facilitate exchange.¹⁴ The extent of gold use for commercial

⁸ For the textual sources, see N. L. Swann, *Food and money in ancient China: The earliest economic history of China to A.D. 25. Han Shu 24 with related texts, Han Shu 91 and Shih-chi 129* (Princeton, 1950); for the coinage, see F. Thierry, *Monnaies chinoises, II: Des Qin aux Cinq Dynasties* (Paris, 2004). See also Peng, *Monetary history*, 102-85. For Wang Mang’s issues, see H. Dubs, *The history of the Former Han Dynasty, III* (Baltimore, 1955), 507-18; R. Thomsen, *Ambition and Confucianism: a biography of Wang Mang* (Aarhus, 1988), 88-90, 117-24; H. Ehrend, *Wang Mang und seine Münzen – The coins of Wang Mang* (Speyer, 2000). The tally of 28 billion is given in *Hanshu* 24B:19b.

⁹ Chinese monetary history is defined by the tension between the market’s assessment of coin according to its intrinsic value and the state’s desire to ensure its acceptance at nominal value. For some aspects, see F. Thierry, ‘De la nature fiduciaire de la monnaie chinoise’, *Bulletin du Cercle d’Etudes Numismatiques* 30, 1 (1993), 1-12. Much of the Han period from Wu’s reign onward appears to have been characterized by a better-than-usual match between nominal and intrinsic value.

¹⁰ A. F. P. Hulswé, *Remnants of Ch’in law: An annotated translation of the Ch’in legal and administrative rules of the 3rd century BC, discovered in Yün-meng Prefecture, Hu-pei Province, in 1975* (Leiden, 1985), 52 (law); *Hanshu* 24B:3b-5b (memorial).

¹¹ *Hanshu* 24B:13a, 14a (Wu); 99B:14b, 15a, 21b, 25b (Wang Mang).

¹² Forthcoming work based on the data in Thierry, *Monnaies chinoises, II*, 171-208.

¹³ Peng, *Monetary history*, 170-4.

¹⁴ Z. Li, ‘A preliminary study of Qin and Han gold currency’, *Zhongguo shi yanjin* (1997), fasc. 1, 52-61 (in Chinese; English abstract in *China Archaeology and Art Digest* 2.1-2 [1997], 146-7); F. Thierry, ‘Sur

purposes is unknown: gold is primarily mentioned in the context of imperial gifts and expenses and within aristocratic circles, although small-scale gold use by commoners is not unheard of. Taken at face value, some of the reported aggregate values are very considerable: 200 tons of gold supposedly disbursed by the emperor Wu (140-87 BC) and 150 tons of gold hoarded in the palace of Wang Mang (AD 23) rival the largest known accumulation of gold in the Roman world and would in principle bestow major monetary importance on gold as a means of exchange and store of value.¹⁵ However, it is unclear how many references to *jin* refer to actual gold or merely represent units of account for allocations that were in fact made in bronze coins.¹⁶ In any case, the sources for the Eastern Han period (AD 25-220) tally a mere 5 tons of gold handed out as imperial gifts, while silver and even silk assumed greater importance.¹⁷ This apparent scarcity of gold persisted to varying degrees under later dynasties, causing later observers to marvel at references to huge gold stocks in the Western Han and Xin periods, which casts further doubt on the true meaning of these reports.¹⁸

In the most general terms, the dichotomy of uncoined precious metals and coined base metals that had emerged in the pre-imperial period and had been formalized under the Qin and Han dynasties survived until the end of the nineteenth century.¹⁹ The Tang dynasty (618-907) introduced the *bao* ('treasure') coins, essentially a revamped version of the *wuzhu* format, while gold and silver ingots were used as a store of value and for international transactions.²⁰ In the Northern Song period (960-1127), economic expansion necessitated huge increases in the production of bronze coins and their supplementation by iron issues, until paper money was introduced in 1160 under the Southern Song (1127-1279) to augment the money supply. Paper money, increasingly less adequately backed by precious metal stocks, gained in importance in the Yuan (1271-1368) and early Ming (1368-1644) periods, until it was de facto abandoned in the 1430s. From then on, uncoined silver took over, greatly boosted by the influx of large quantities of silver from the New World and Japan from the mid-sixteenth century onward. Song coin remained of great importance under the Yuan, and private production of bronze coinage eclipsed occasional attempts by the Ming state to revive public minting. Bronze coin once again assumed greater importance in the Qing period (1644-1911).²¹ While European silver coins had been circulating in China since the Ming

les spécificités fondamentales de la monnaie chinoise', in A. Testart (ed.), *Aux origines de la monnaie* (Paris, 2001), 109-44, at 132, 140 n. 22.

¹⁵ Peng, *Monetary history*, 135-6 (Wu); *Hanshu* 99C:25a-b, with H. Dubs, 'An ancient Chinese stock of gold', *Journal of Economic History* 2 (1942), 36-9 (Wang Mang); cf. Harl, *Coinage*, 176. Elite use: Peng 135-8. Commoners: *Jiuzhang suanshu* 6.3; 7.5; 8.7, in K. Vogel, *Neun Bücher arithmetischer Technik: Ein chinesisches Rechenbuch für den praktischen Gebrauch aus der frühen Hanzeit (220 v. Chr. bis 9 n. Chr.)* (Braunschweig, 1968), 63, 72, 84.

¹⁶ Thus Peng, *Monetary history*, 134 n. 1, cf. 136.

¹⁷ *Ibid.* 137-8, 145-6.

¹⁸ *Ibid.* 135 n. 9.

¹⁹ In the Tang and Song periods, gold and silver coins were occasionally minted as special gifts for aristocrats and courtiers, and for deposition in imperial tombs: *ibid.* 280-1, 362-4.

²⁰ *Ibid.* 246-59, 276-82.

²¹ R. von Glahn, *Fountain of fortune: money and monetary policy in China, 1000-1700* (Berkeley, Los Angeles, and London, 1996) is the most important study of monetary developments from the Song to the early Qing periods.

period, the state did not issue (hole-less) silver coins until the 1830s, and only in insignificant quantities until 1897.²²

Causation

Why did the early Chinese states privilege bronze coins and – with a single exception (see below) – refrain from coining precious metals? An answer to this question requires consideration of the interplay of several variables: in the following, I focus on the bullion supply; military structures; political and ideological motivations; and path dependence.

The metal supply was arguably of critical importance. The earliest ‘Aegean’ coins were made of electrum found on Mount Tmolos and in the Paktolos River in Lydia: it has even been argued that this alloy’s variable gold and silver content might have encouraged the creation of the coin format *per se*.²³ Silver dominated the Greek currency system thanks to the deposits of Attica, Thrace, Siphnos, and Samos. Central Asian and Indian gold supported the Kushan and Gupta dinars. Gold issues by Celtic polities were driven by supply, just as bullion imports from Nubia and the Senegal/Niger region accounted for the temporary shift from silver to gold currencies in the early Islamic Middle East, the opening of new mines in twelfth- and thirteenth-century Europe ended the previous monetary recession, fourteenth-century gold imports from Guinea facilitated the re-introduction of gold coinage in late medieval Italy, the discovery of rich Tyrolean silver mines in the fifteenth century and subsequent massive transfers from the newly acquired Spanish territories of Mexico and Peru sustained the production and eventual dominance of heavy silver coins in western Europe, and Brazilian gold supported the later British gold currency.²⁴ In the Roman period, the conquest and exploitation of previously marginal gold-rich regions such as north-western Spain, Bosnia and Dacia had given a massive boost to the Roman imperial gold currency. No comparable resources were available in the Chinese heartland. While the lack of ancient Chinese statistics forestalls direct comparisons between the Roman and Han empires, references to gold and silver output in later dynasties points to dramatic imbalances in the precious metal supply. In the first century AD, the Baebelo mines in Spain reportedly netted 35.4 tons of silver in state revenue alone per year, while the gold mines of Asturia and Bosnia yielded 6.5 and 5.8 tons per year, respectively.²⁵ These data compare extremely favorably with reports that silver mining yields in the entire Tang empire totaled perhaps half a ton per year, and not more than one ton at their peak (or perhaps up to five times as much if these tallies refer to tax revenue on mining output, still far below Roman levels). Under the early Song, annual output figures ranged from 5.4 to 8.2 tons of silver, with a peak of 33 tons

²² Peng, *Monetary history*, 668-706. Public gold issues were virtually non-existent (689).

²³ R. B. Wallace, ‘The origin of electrum coinage’, *AJA* 91 (1987), 385-97.

²⁴ A good example is the Boii’s switch from gold to silver after their move from Bohemia to Slovakia around 60 BC (Göbl, *Antike Numismatik* 118). For the early medieval Middle East, see E. Ashtor, *A social and economic history of the Near East in the Middle Ages* (Berkeley, Los Angeles, and London, 1976), 80-1, and for Europe J. Williams (ed.), *Money: a history* (London, 1997), 78, 80, 162, 165, 176. J. F. Richards (ed.), *Precious metals in the later medieval and early modern periods* (Durham NC, 1983) contains instructive case studies.

²⁵ Harl, *Coinage*, 81-2. Dacian output must also have been considerable.

in 1022, accompanied by a puny half-ton of gold.²⁶ If anything, mining yields in the Warring States and Han periods must have been lower still: gold was mostly derived from placer deposits in riverbeds while deep-vein mining, if it occurred at all, appears to have been rare. A recent comprehensive survey of historical mineral extraction in China reveals that very few gold mines are known to have operated in the Han period. Silver was rarer still: as silver deposits were overwhelmingly concentrated in the remote south, mining output remained minimal prior to the Tang period.²⁷

Differences in military practice may also help account for the popularity of precious-metal coins in western and central Eurasia and the dominance of bronze coin in ancient China. The incentives for the creation of the earliest coin issues in the Aegean continue to be much debated, and it is true that military demands do not appear to have played a central role, despite the fact that the need to pay mercenaries was once mooted as a possible motive.²⁸ It is also clear that archaic Greek coinage, once it had been adopted by a large number of poleis, was frequently used for market exchange (especially the large quantities of small denominations), and not merely or even predominantly for military purposes. At the same time, the gradual spread of precious-metal coinage beyond the very particular environment of the Greek polis was arguably much more forcefully driven by military concerns: while the Hellenistic kingdoms, imperial Carthage, and mid-Republican Rome are the most unambiguous examples, various Iranian empires or Iberian and Celtic polities may well belong in the same category. High value and low weight made silver coins in particular useful media for the compensation of professional soldiers, especially compared to unwieldy high-bulk and low-value base metal denominations. In ancient China, the conscription of large numbers of civilians by increasingly well-organized and coercive imperial states obviated the need for cash payments on a large scale.²⁹ There is no clear evidence of monetary stipends in the Warring States and Western Han periods: assuming that troops were provisioned in kind, bronze cash would have been adequate for small additional outlays.³⁰ It need not be a coincidence that when the early Tang dynasty restored a uniform imperial bronze currency, it operated a military mobilization system that combined military service with farming, and did not require high-value coin for military payments.³¹ Moreover, the only western power that initially relied on comparable practices of mass conscription, the Roman Republic, did not feel a pressing need to adopt Greek-style silver coinage until it entered large-scale conflict with Greek and Hellenized competitors, but issued instead

²⁶ Peng, *Monetary history*, 278, 430.

²⁷ P. J. Golas, *Science and civilization in China. Vol. 5: Chemistry and chemical technology. Part XIII: Mining* (Cambridge, 1999), 109-23 (gold), 123-36 (silver). Cf. also E. C. Bunker, 'The enigmatic role of silver in China', *Orientalism* 25.11 (1994), 76-7, for the rarity of pre-Tang silver.

²⁸ R. M. Cook, 'Speculations on the origins of coinage', *Historia* 7 (1958), 257-62. For the debate, see most recently D. M. Schaps, *The invention of coinage and the monetization of ancient Greece* (Ann Arbor, 2004), 96-101, with discussion of previous interpretations.

²⁹ M. E. Lewis, 'Warring States political history', in M. Loewe and E. L. Shaughnessy (eds.), *The Cambridge history of ancient China from the origins of civilization to 221 B.C.* (Cambridge, 1999), 620-32; 'The Han abolition of universal military service', in H. van de Ven (ed.), *Warfare in Chinese history* (Leiden, 2000), 33-75.

³⁰ Gold and cash were envisioned as special rewards: Peng, *Coinage*, 170.

³¹ D. A. Graff, *Medieval Chinese warfare, 300-900* (London and New York, 2002), 189-90.

(large) bronze denominations for stipends and other disbursements.³² Ancient China, by contrast, was never drawn into an environment dominated by precious-metal coinage.

Political circumstances likewise favored a monopoly of bronze coin in early imperial China. The southern state of Chu, one of the main contenders for supremacy over the whole region, was the only (comparatively) gold-rich region in ancient China proper: gleaned from rivers, the gold of Chu accounts for all known finds of gold bullion and the majority of finds of gold objects from the Warring States period.³³ From the fifth to the third centuries BC, the government of Chu oversaw the production of small squares of gold that were cast as parts of large sheets stamped with a series of (ideally) rectangular seal marks. Individual squares could be broken or cut off for separate use. Each stamp bore the denomination (*yuan*) and the name of the Chu capital. Though surviving specimens vary considerably in shape and weight, two samples of reasonably well-preserved rectangles yield a mean weight of approximately 15 grams, which is consistent with a target weight of 1 *liang* (15.3g).³⁴ At 1.9 times the weight of an Augustan *aureus* or 3.4 times the weight of a Constantinian *solidus*, this renders the average Chu gold unit functionally equivalent to a large gold coin. The actual monetary importance of these gold rectangles is obscure: according to an observer from the Song period over 1,000 years later, “very many people” had found specimens in the ground and in rivers, which may indicate that they had not been uncommon and had perhaps been used in similar ways as ‘Aegean’ precious-metal coins.³⁵ There is no indication that these gold plates were issued beyond Chu’s conquest by Qin in 223 BC: while specimens continued to be hoarded into the Eastern Han period, the nature of these items – with the name of the rival Chu capital stamped on the obverse – makes it highly unlikely that they could be manufactured under the centralizing Qin regime. As a later source observed, ‘if the coinage is unified, the people will not serve two masters’ (*Hanshu* 24B:5b). A possible parallel in the form of gold ornaments with inscribed weights found at Yanxiadu, the capital of the northern state of Yan from 311 to 222 BC, likewise does not appear to have outlasted the Qin conquest: in this case, however, even less is known about the purpose of these items.³⁶ Overall, we need to combine the factors of metal supply and conquest: whereas only Chu produced enough bullion to maintain a proto-coinage in gold

³² See briefly M. H. Crawford, *Coinage and money under the Roman Republic: Italy and the Mediterranean economy* (London, 1985), 22-3, on the introduction of army pay using *aes grave* in 406 BC.

³³ Peng, *Monetary history*, 72-3; W. Ran, ‘Gold and silver production in the Spring and Autumn and Warring States periods in the light of archaeological findings’, *Xibei Daxue xuebao* (1997), fasc. 2, 96-100 (in Chinese; English abstract in *China Archaeology and Art Digest* 1.2 [1997], 131-2); Peng, *Coinage*, 209-12. On Chu in general, see esp. C. A. Cook and J. S. Major (eds.), *Defining Chu: image and reality in ancient China* (Honolulu, 1999).

³⁴ N. V. Ivochkina, ‘The early Chinese Chu gold plates, 5th-3rd cent. B.C.’, in *Actes 11th International Congress of Numismatics, III* (Louvain-la-Neuve, 1993), 329-32; Peng, *Monetary history*, 73-4; D. Lu and Y. Wu, ‘Chu gold coins unearthed in Hubei’, *Zhongguo qianbi* (1997), fasc. 1, 38 (in Chinese; English abstract in *China Archaeology and Art Digest* 2.1-2 [1997], 147); Peng, *Coinage*, 209-12. The same target weight of 1 *liang* is arguably implied by a sample of 5 small Han ‘deer-hoof’ gold ingots: Peng, *Monetary history*, 144 n. 68. Cf. D. Hou, ‘A supplementary study of the units of measurement of Chu gold currency, and a discussion of three groups of bronze weights with inscriptions from Chu tombs’, *Zhongguo qianbi* (1996), fasc. 1, 10-12 (in Chinese; English abstract in *China Archaeology and Art Digest* 2.1-2 [1997], 145-6) on gold measurement standards.

³⁵ Peng, *Monetary history*, 73 n. 26.

³⁶ E. C. Bunker, ‘Gold in the ancient Chinese world: a cultural puzzle’, *Artibus Asiae* 53 (1993), 45-6.

while the other states relied on bronze, the ultimate success of Qin (with its bronze *banliang* coins) led to the suppression of alternative forms of cast money. We can only speculate what might have happened if Chu had emerged victorious: while supply constraints would still have militated against the creation of an imperial gold currency on the Roman scale, precious-metal denominations could well have been retained as a potent symbol of the conquering power. The actual outcome of the conflict between Qin and Chu adds an element of contingency to the fundamental ecological constraints imposed by the metal supply and the systemic features of military service.

This raises related issues, those of ideological conservatism and attendant path dependence. The triumph of the ‘bronze-coin’ state of Qin over the ‘gold-square’ state of Chu and assorted other rivals lies behind the later statement that ‘actual gold which weighed one *yi* was given the name “currency of the first class”, and while the copper coins were the same as the Zhou cash on the reverse surface, their inscription read *banliang*, and their weight accorded with the legend’ (*Hanshu* 24B:3a). Although this claim is untrue in so far as there is no evidence of normed *yi*-sized gold ingots and the actual weight of the *banliang* coins regularly fell short of half a *liang*, it may nevertheless reflect the official standard that imposed uniform – if notional – conventions and sought to define ‘proper’ money to the extent that not even silver was deemed an acceptable monetary medium: according to this version of the new imperial reality, ‘pearls, jade, tortoise [shell], cowries, silver, and tin ... were not money’ (*ibid.*). The Han regime, though at least initially rather weak and unable to enforce monetary regulations across its heterogeneous realm, officially adopted equivalent arrangements. Once this system had been in place for several centuries, any deviation from the putatively ‘universal’ gold-bar/bronze-coin norm of a universal empire seemed remarkable: this is why the use of silver or gold for the manufacturing of coins was specifically noted among the strange habits of distant barbarians such as Parthians and Romans.³⁷ When the Chinese state finally encountered ‘Aegean’ coinage after its expansion into the Tarim Basin of Xinjiang that bordered on the emerging Kushan empire, hybrids in the form of solid coins with Hellenic (or Greco-Indian) motifs on one side and Chinese symbols (or weight marks) on the other one ensued but remained confined to that transitional frontier.³⁸ Sasanid and early Byzantine precious-metal coins that later arrived in China proper ended up as jewelry. The issue of massive amounts of Qin-Han-style bronze coins became a defining characteristic of the restorationist dynasties of Tang and Song. As the pedigree of the dichotomy of uncoined precious metal bars and coined base metal kept growing with increasing age, precious metal-coins became ever less conceivable. A real-life counterfactual is conveniently provided by Japan, which began to imitate early Tang coins from the late seventh century AD onward. In the first phase of production, in the Nara and Heian periods, the dominant copper issues were occasionally supplemented by silver (and once even gold) coinage. Following a prolonged hiatus beginning in the tenth century when Japan relied on imported Song cash, the revival of minting in the fifteenth century once again generated gold and silver coins alongside the greatly expanding

³⁷ D. D. Leslie and K. H. J. Gardiner, *The Roman empire in Chinese sources* (Rome, 1996), 224-5.

³⁸ F. Thierry, ‘Die Geschichte des chinesischen Geldes von den Ursprüngen bis zum Beginn des 20. Jahrhunderts’, in W. Seipel (ed.), *Geld aus China* (Vienna, 2003), 73, 76; Williams, *Money*, 139.

growing copper currency.³⁹ Despite strong Chinese influence with respect to design and the conventional emphasis on low-value copper cash, the Japanese were perfectly willing to convert precious metals into coin.⁴⁰ By far the strongest evidence of Chinese monetary path dependence is furnished by the fact that even after the influx of thousands of tons of silver from Japan and especially from the Spanish colonies in the New World enabled late Ming China to maintain a silver-based monetary system, silver continued to circulate as weighed bullion and was never converted into regular coin.⁴¹

Taken together, the environmental, military, and political conditions detailed in this section help us understand why the early Chinese states mostly relied on low-value bronze coins (tool-shaped or round), alternative formats were suppressed upon imperial unification, and the Qin and early Han regimes endeavored to impose a two-tier currency system of uncoined gold and coined bronze. However, while these factors may arguably be sufficient to account for the initial characteristics of Chinese coinage, they fail to explain the subsequent rigidity of the monetary tradition in the face of changing circumstances. Thus, the shift to professional armies first in the Eastern Han period and once again under the late Tang and the Song failed to encourage the introduction of (objectively useful) precious-metal coin, while a dramatic increase in the silver supply in the late Ming period likewise proved to be of no consequence for the character of the imperial coinage. This long-term inflexibility stands in marked contrast not only to China's own willingness to experiment with paper money on a large scale but also to the monetary traditions of a large number of historical states that repeatedly adapted their currency systems to changes in metal supply or monetary demand. Against this background, ideological traditions must be assumed to have been instrumental in maintaining the conventional metallistic model. 'Path dependence' is merely a description of a process, and not its explanation: the roots of China's monetary exceptionalism may need to be sought in the specific properties of the belief system that shaped the decisions of the imperial ruling class, a search that calls for a cross-cultural perspective. Comparative monetary history requires us to draw on a wide variety of variables well beyond the sphere of – ultimately descriptive – numismatics.

Further questions

What is the utility of macro-historical comparisons of this kind? It is difficult to assess the significance and causal mechanisms of a particular historical development – such as the creation of precious-metal coinage – without considering alternatives, be it hypothetical counterfactuals (asking what would have had to be different in order to

³⁹ The earliest archaeologically known coins only slightly pre-date the canonical date of AD 708 for the first emission: *The Japan Times* 20 January 1999. For brief summaries of pre-Meiji monetary history, see W. M. McCullough, 'The capital and society', in D. H. Shively and W. H. McCullough (eds.), *The Cambridge History of Japan, II* (Cambridge, 1999), 162, 164; G. C. Hurst, 'Insei', *ibid.* 636-7; A. Naohiro, 'The sixteenth-century unification', in J. W. Hall (ed.), *The Cambridge History of Japan, IV* (Cambridge, 1991), 61-2; T. Tatsuya, 'Politics in the eighteenth century', *ibid.* 453.

⁴⁰ Korea and Annam (Vietnam), by contrast, were more closely integrated into the Chinese cash system and did not mint precious-metal coins until the nineteenth century: P. Grierson, *Numismatics* (London, Oxford, and New York, 1975), 64-5, 70-1.

⁴¹ Von Glahn, *Fountain of fortune*, 113-41.

generate different outcomes, which in turn helps identify the critical features that resulted in observed outcomes) or actual counterexamples, such as the bronze-coinage tradition of imperial China (enabling us to ask what did in fact happen differently, and why). Thus far, my survey has focused on explaining specific developments in China – what I have termed Chinese ‘monetary exceptionalism’ – as if developments in other parts of the world could safely be considered ‘normal’, that is, not in comparable need of explication.

In some sense, this position, while undoubtedly politically incorrect (imputing as it does normative status to ‘western’ conventions), need not be entirely without merit. ‘Normal’, understood in purely quantitative terms, does not necessarily entail value judgments but merely denotes relative frequency. In this respect, ‘Aegean’ coinage, in its manifold global manifestations, would seem to have a strong claim to normative status: many different societies across the world saw some merit in coins made of gold and silver, and issued them accordingly. At the same time, we must bear in mind that the expansion of ‘Aegean’ conventions owed much to successful imperialism (most notably the eastern conquests of Alexander the Great or the western conquests of Rome) or its indirect consequences. The adoption of precious-metal coinage by societies that had previously had little use for it (such as Carthaginians or Romans, or various Central Asian regimes succeeding the Greco-Bactrian kings) in the context of their incorporation into an established Hellenistic ‘world system’ may reflect another case of – self-reinforcing – path dependence: the more prevalent these coins became, and the more they were associated with dominant powers, the more likely they were to be adopted by outsiders and newcomers.

In the final analysis, there is nothing inherently ‘normal’ or inevitable about the conversion of gold and silver into standardized coin: the minting of precious metals entails losses through surface wear that could be reduced by the exchange of more substantial ingots (although the apportioning of gold or silver into small slivers similarly causes wastage), and – from the vantage point of established elites – might have the socially and politically undesirable consequences of undermining traditional hierarchies by concentrating considerable wealth in standardized and exceedingly mobile units of exchange, an aspect that has recently attracted attention in studies of the impact of Archaic Greek coinage.⁴² The main pragmatic advantage of precious-metal coin may be located at the intermediate level between the use of individual base-metal denominations for petty transactions and the – functionally interchangeable – use of either gold and silver bars or large numbers of gold and silver coins. The *Jiuzhang suanshu*, a mathematical manual of the Western Han period, suggests that seven cows could change hands for 173 grams of gold, whereas in other examples the same transaction would require between 27 and 41 kilograms of bronze coins: no (official) intermediate media were available (8.7-8 & 11). Yet it is primarily – and perhaps even exclusively – in the military sphere that the portability and fungibility of normed units of silver in particular would greatly outweigh the utility of either tiny amounts of cut precious metal or large numbers of bronze coins.

The Phoenician and Carthaginian experience shows that there is nothing inevitable about coinage: for a considerable amount of time, trade and other interaction

⁴² L. Kurke, *Coins, bodies, games, and gold: the politics of meaning in archaic Greece* (Princeton, 1999), esp. 41-64, 101-29.

with the coin-bearing Greeks prompted little or no desire for imitation.⁴³ Coins are not inherently irresistible. Nor, as the Chinese case demonstrates, is the coining of gold and silver a logical corollary of the minting of bronze: the latter may occur on a vast scale even in the complete absence of the former. It also shows that superficially similar conditions fail to encourage comparable design choices. Both Archaic Greek coins and the utensil money and round coins of Warring States China developed in environments of political fragmentation and inter-state competition: yet whereas Greek issues from the beginning emphasized sacred images and other community-related symbols, Chinese states favored the less intuitively distinctive combination of central hole and peripheral legend.

The eventual near-global success of the ‘Aegean’ tradition might tempt us to assume that gold and silver issues with pictorial imagery represent a default position in coin production. The Chinese experience, however, establishes that large-scale coin use requires neither precious metals nor pictures. Inevitably, a sample of two (that is, two independent instances of the invention of coinage) makes it impossible to judge the ‘typicality’ of either case. As I argued above, both the circumstances surrounding the creation of the ancient Chinese imperial currency system and the reasons for its long-term durability (alongside greater flexibility within China’s own sphere of monetary influence, such as in Japan) warrant careful consideration and comparative analysis. Yet the same applies in equal measure to the specific characteristics of the ‘Aegean’ model: was an appetite for putting small normed precious-metal objects with vibrant imagery in the hands of commoners a peculiar function of the nature of the Greek polis? Recent research suggests that there may well have been something quintessentially ‘Greek’ about this process.⁴⁴ Enhanced awareness of the ‘Chinese alternative’ and its genesis will aid us in the vital task of de-familiarizing and re-problematizing the ‘Aegean’ experience.

Bibliography

Ashtor, E., *A social and economic history of the Near East in the Middle Ages* (Berkeley, Los Angeles, and London, 1976).

Bunker, E. C., ‘Gold in the ancient Chinese world: a cultural puzzle’, *Artibus Asiae* 53 (1993), 27-50.

Bunker, E. C., ‘The enigmatic role of silver in China’, *Orientalia* 25.11 (1994), 73-8.

Carradice, I., ‘The “regal” coinage of the Persian empire’, in I. Carradice (ed.), *Coinage and administration in the Athenian and Persian empires* (Oxford, 1987), 73-108.

Cook, C. A., and Major, J. S. (eds.), *Defining Chu: image and reality in ancient China* (Honolulu, 1999).

Cook, R. M., ‘Speculations on the origins of coinage’, *Historia* 7 (1958), 257-62.

⁴³ On Phoenician coinage – produced from the mid-fifth century BC onward under Greek influence and presumably for trade with Greeks, and more widely used only in the fourth century BC –, see J. Elayi and A. G. Elayi, *Trésors de monnaies phéniciennes et circulation monétaire (Ve – IVe siècles avant J.-C.)* (Paris, 1993). Carthage did not mint coins until the end of the fifth century BC, and from then on for conflict with the Greeks (cf. Lee, ‘Entella’).

⁴⁴ E.g., S. von Reden, *Exchange in ancient Greece* (London, 1995); ead., ‘Money, law, and exchange: coinage in the Greek polis’, *JHS* 117 (1997), 154-76; Kurke, *Coins*; Schaps, *Invention of coinage*, 108-9.

- Crawford, M. H., *Coinage and money under the Roman Republic: Italy and the Mediterranean economy* (London, 1985)
- Dubs, H., 'An ancient Chinese stock of gold', *Journal of Economic History* 2 (1942), 36-9.
- Dubs, H., *The history of the Former Han Dynasty, III* (Baltimore, 1955).
- Ehrend, H., *Wang Mang und seine Münzen – The coins of Wang Mang* (Speyer, 2000).
- Elayi, J., and Elayi, A. G., *Trésors de monnaies phéniciennes et circulation monétaire (Ve – IVe siècles avant J.-C.)* (Paris, 1993).
- Göbl, R., *Antike Numismatik, I* (Munich, 1978).
- Golas, P. J., *Science and civilization in China. Vol. 5: Chemistry and chemical technology. Part XIII: Mining* (Cambridge, 1999).
- Graff, D. A., *Medieval Chinese warfare, 300-900* (London and New York, 2002).
- Grierson, P., *Numismatics* (London, Oxford, and New York, 1975).
- Harl, K. W., *Coinage in the Roman economy, 300 B.C. to A.D. 700* (Baltimore and London, 1996).
- Hou Dejun, 'A supplementary study of the units of measurement of Chu gold currency, and a discussion of three groups of bronze weights with inscriptions from Chu tombs', *Zhongguo qianbi* (1996), fasc. 1, 10-12 (in Chinese; English abstract in *China Archaeology and Art Digest* 2.1-2 [1997], 145-6).
- Hulsewé, A. F. P., *Remnants of Ch'in law: An annotated translation of the Ch'in legal and administrative rules of the 3rd century BC, discovered in Yün-meng Prefecture, Hupei Province, in 1975* (Leiden, 1985).
- Hurst, G. C., 'Insei', in D. H. Shively and W. M. McCullough (eds.), *The Cambridge History of Japan, II* (Cambridge, 1999), 576-643.
- Ivotchkina, N. V., 'The early Chinese Chu gold plates, 5th-3rd cent. B.C.', in *Actes 11th International Congress of Numismatics, III* (Louvain-la-Neuve, 1993), 329-2.
- Karwiese, S., *Die Münzprägung von Ephesus, I* (Vienna, 1995).
- Kim, H. S., 'Small change and the moneyed economy', in P. Cartledge, E. E. Cohen, and L. Foxhall (eds.), *Money, labour and land: approaches to the economies of ancient Greece* (London, and New York, 2002), 44-51.
- Kurke, L. *Coins, bodies, games, and gold: the politics of meaning in archaic Greece* (Princeton, 1999).
- Lee, I., 'Entella: the silver coinage of the Campanian mercenaries and the site of the first Carthaginian mint 410-409 BC', *NC* 160 (2000), 1-66.
- Le Rider, J. *La naissance de la monnaie: pratiques monétaires de l'Orient ancien* (Paris, 2001).
- Leslie, D. D., and Gardiner, K. H. J., *The Roman empire in Chinese sources* (Rome, 1996).
- Lewis, M. E., 'Warring States political history', in M. Loewe and E. L. Shaughnessy (eds.), *The Cambridge history of ancient China from the origins of civilization to 221 B.C.* (Cambridge, 1999), 587-650.
- Lewis, M. E., 'The Han abolition of universal military service', in H. van de Ven (ed.), *Warfare in Chinese history* (Leiden, 2000), 33-75.
- Li Zude, 'A preliminary study of Qin and Han gold currency', *Zhongguo shi yanjin* (1997), fasc. 1, 52-61 (in Chinese; English abstract in *China Archaeology and Art Digest* 2.1-2 [1997], 146-7).

- Lu Depei and Wu Yuqing, 'Chu gold coins unearthed in Hubei', *Zhongguo qianbi* (1997), fasc. 1, 38 (in Chinese; English abstract in *China Archaeology and Art Digest* 2.1-2 [1997], 147).
- McCullough, W. M., 'The capital and its society', in D. H. Shively and W. M. McCullough (eds.), *The Cambridge History of Japan, II* (Cambridge, 1999), 97-182.
- Naohiro, A., 'The sixteenth-century unification', in J. W. Hall (ed.), *The Cambridge History of Japan, IV* (Cambridge, 1991), 40-95.
- Peng Ke, 'Coinage and commercial development in Eastern Zhou China' (Ph.D. thesis University of Chicago, 2000).
- Peng Xinwei, *A monetary history of China, I-II* (Bellingham WA).
- Ran Wanli, 'Gold and silver production in the Spring and Autumn and Warring States periods in the light of archaeological findings', *Xibei Daxue xuebao* (1997) fasc. 2, 96-100 (in Chinese; English abstract in *China Archaeology and Art Digest* 1.2 [1997], 131-2).
- Richards, J. F. (ed.), *Precious metals in the late medieval and early modern periods* (Durham NC, 1983).
- Schaps, D. M. *The invention of coinage and the monetization of ancient Greece* (Ann Arbor, 2004).
- Swann, N. L. *Food and money in ancient China: The earliest economic history of China to A.D. 25. Han Shu 24 with related texts, Han Shu 91 and Shih-chi 129* (Princeton, 1950, repr. New York, 1974).
- Tatsuya, T., 'Politics in the eighteenth century', in J. W. Hall (ed.), *The Cambridge History of Japan, IV* (Cambridge, 1991), 425-77.
- Thierry, F., 'De la nature fiduciaire de la monnaie chinoise', *Bulletin du Cercle d'Etudes Numismatiques* 30, 1 (1993), 1-12.
- Thierry, F., *Monnaies chinoises, I: L'antiquité préimpériale* (Paris, 1997).
- Thierry, F., 'Sur les spécificités fondamentales de la monnaie chinoise', in A. Testart (ed.), *Aux origines de la monnaie* (Paris, 2001), 109-44.
- Thierry, F., 'Die Geschichte des chinesischen Geldes von den Ursprüngen bis zum Beginn des 20. Jahrhunderts', in W. Seipel (ed.), *Geld aus China* (Vienna, 2003), 25-89.
- Thierry, F. *Monnaies chinoises, II: Des Qin aux Cinq Dynasties* (Paris, 2004).
- Thomsen, R., *Ambition and Confucianism: a biography of Wang Mang* (Aarhus, 1988).
- Vogel, K., *Neun Bücher arithmetischer Technik: Ein chinesisches Rechenbuch für den praktischen Gebrauch aus der frühen Hanzeit (220 v. Chr. bis 9 n. Chr.)* (Braunschweig, 1968).
- Von Glahn, R. *Fountain of fortune: money and monetary policy in China, 1000-1700* (Berkeley, Los Angeles, and London, 1996).
- Von Reden, S., *Exchange in ancient Greece*, (London, 1995).
- Von Reden, S., 'Money, law, and exchange: coinage in the Greek polis', *JHS* 117 (1997), 154-76.
- Wang Yü-ch'üan, *Early Chinese coinage* (New York, 1951).
- Weidauer, L., *Probleme der frühen Elektronprägung* (Fribourg, 1975).
- Williams, J. (ed.), *Money: a history* (London, 1997).