in Anatolian sites, including tripartite spearheads with leaf-shaped blades, daggers with cast handles, and ribbon-shaped diadems. These artefacts first appear in Maikop kurgans before being found in large numbers at Arslantepe and Başur Höyük, and later in various funerary contexts along the Upper and Middle Euphrates valley throughout the third millennium BCE. Massimino further advances that techniques such as lost-wax casting and silver inlay decoration indicate that technological knowledge moved alongside prestige goods, which alludes to the role of mobile groups in sustaining these networks. On the social and economic systems that facilitated the circulation of metal between the north-western Caucasus and the upper reaches of the Euphrates and Tigris valleys further research could yield tantalising results.

This collective work, which sets out the many avenues of research still open on the inexhaustible theme of the thousand-year-old uses of metal – on which we can debate, agree and disagree with certain arguments, is a fine example of what the history of techniques can contribute to our knowledge of ancient societies. Lying between the limits of current knowledge, as one of the contributors reminds us (Pare, Chapter 6), it is also a period piece, pointing the way forward for future research. The richness of perspectives it presents, nevertheless, ensures that archaeologists and historians in different fields will find it of interest, which is always a welcome feature of a scholarly work.

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Michael Loy, *Connecting communities in archaic Greece: exploring economic and political networks through data modelling*. British School at Athens studies in Greek antiquity. Pp. xv+ 331. Cambridge – New York: Cambridge University Press, 2023. ISBN: 9781009343817, hardcover $130.

Michael Loy's monograph is an innovative and intriguing contribution to the growing body of work using computational methods in archaeology. It takes advantage of the vast – and often unwieldy – datasets produced by more than a century of excavations in Greece, especially by the foreign schools, analysed by Loy through Social Network Analysis and spatial modelling to make sense of economic and political interactions across the Aegean in the seventh and sixth centuries BC.

The central idea is fairly straightforward: that there is analytical potential in treating communities as nodes and patterns of shared material culture as indicators of interaction (a recent parallel for this kind of approach is S. Murray, *The Collapse of the Mycenaean Economy*, Cambridge 2017). Loy focuses on four types of evidence – sculpture, pottery, coins, and inscriptions – and uses these to generate visual models of connectivity over time. The chronological span (700–500 BC, broken into fifty-year periods) and geographical range (the wider Aegean basin) are both sensible choices, and the sheer scale of the undertaking is impressive.

After an informative introduction – particularly excellent in explaining how the modelling used in the book actually works, Chapter 2 takes up the question of marble transport for the production of kouroi and korai. Drawing on existing catalogues, Loy compiles a dataset of 305 kouroi and 174 korai, reconstructing their original dimensions (often from fragmentary remains) to estimate their total marble volume. His calculations suggest that roughly 90,000 tonnes of marble were quarried and moved across the Aegean over the course of 150 years. If these calculations are accurate, this would have required around 200 ships annually at least partially loaded with heavy marble. To visualise how this material might have travelled, Loy turns to Proximal Point Analysis, mapping probable shipping corridors from quarry to sanctuary or city. He identifies four main maritime routes: one threading through the

Dodecanese, another across the Ikarian Sea, a third running through the Euboean straits, and a fourth into the Saronic Gulf. The regional distinctions are striking: Naxian marble appears to have dominated the eastern Aegean, while Parian marble was preferentially routed to Athens and its environs. Loy interprets these patterns as evidence of a socially embedded economy in which elite actors competed through conspicuous votive display. The sheer logistical effort involved – securing quarry rights, organizing transport, arranging for sculptors – suggests a level of coordination that cuts across the usual boundaries of polis autonomy. In this reading, marble itself becomes a medium of political performance, with dedications in prestigious sanctuaries doubling as expressions of inter-regional connectivity.

Chapter 3 turns to the circulation of ceramics, treated here both as commodities and as semi-luxury items within the broader Aegean exchange network. Loy compiles an impressive dataset – over 25,000 pottery fragments from 32 sites – and uses distribution mapping and Principal Component Analysis to trace patterns in four major ware types: Attic, Corinthian, Ionian, and local productions, broken down into 50-year periods of analysis. What emerges is a set of striking patterns of consumption: urban centres tend to favour locally produced wares while sanctuaries present more eclectic assemblages, often with preference for particular shapes or fabrics – Delos, for instance, shows a concentration of aryballoi likely linked to oil dedications, whereas Perachora favours pyxides, plausibly associated with the storage of exotic substances. Loy interprets these distributions as evidence of shared knowledge networks among producers and consumers, underpinned by a degree of functional specialisation that he reads to indicate that communities focused on products they could produce most efficiently. The analysis is extended through further modelling: Proximal Point Analysis is again used to reconstruct plausible maritime routes, suggesting that later movements of marble often followed the same corridors established by ceramic exchange. In this sense, high-value exchange appears to have been layered onto older commodity routes, with luxury transport 'piggybacking' on existing logistical infrastructures. The overall implication is a complex system in which socially embedded practices coexist with, and are perhaps even enabled by, market-oriented behaviour – a welcome and compelling challenge to traditional accounts of the Archaic economy as primarily shaped by status and gift exchange.

Chapter 4 tackles the remarkably swift diffusion of coinage across the Aegean during the sixth century BCE, focusing on shared weight standards to trace economic interconnections. Loy draws on a dataset of 631 coin series from 60 sites and uses network visualisations to map clusters of communities that employed the same (or closely related) standards. These clusters, he believes, mark zones of regular exchange and information flow, with coinage networks gradually expanding from regional to more extensive – Aegean-wide. This development, Loy argues, mirrors (while lagging slightly behind) the distribution patterns observed in ceramic exchange, which suggests that established trade networks created the conditions for the adoption of new technologies. One worry, here, is that recent developments in the study of Archaic coinage point to the introduction of coinage in the mid-seventh century BCE, if not earlier. Has this been taken into account? Have dates, and even in some cases places of origin/issuing in the old coin hoard publications used to create the database been adjusted? If not, the temporal development of the introduction of coinage vis-à-vis ceramic exchange might end up looking very different... Be that as it may, in Loy's reading, coinage does not emerge in isolation but rather as a secondary layer within a broader environment of connectivity. Communities already linked through ceramic trade appear, in his account, to have been more receptive to innovations in minting, with key sites such as Samos acting as conduits between the eastern and western Aegean. Loy uses the alignment of weight standards as a proxy for technological and institutional knowledge transfer, highlighting how these 'learning' relationships enabled the spread of coinage. The picture that emerges is one of entangled networks, where forms of interaction in one domain – pottery, in this instance – serve as scaffolding for new forms of exchange, ultimately helping to explain how coinage, as a complex and culturally contingent innovation, gained traction so rapidly across the Greek world.

Chapter 5 turns to the epichoric alphabets, reading them as potential markers of collective identity and political affiliation. Loy begins by embedding writing styles within broader material processes of identity construction, using similarity matrices to explore patterns of co-variance across five selected letter groups in a corpus of 1,356 inscriptions. The resulting network visualisations – produced via modularity analysis – reveal fluid and at times surprising clustering patterns, which call into question the fixed regional groupings established by Kirchhoff and Jeffery. Chronological variation is also central to Loy's argument. For the early sixth century, the data largely support traditional regional

divisions, with alphabetic forms cohering along recognisable lines. But, by the later sixth century, these boundaries become blurrier: the clusters become increasingly fragmented and overlapping, particularly at panhellenic sanctuaries such as Delphi and Olympia, where inscriptions following multiple alphabetic traditions appear side by side. For Loy, this diversity is not simply a reflection of geographical mixing, but rather a sign of deliberate, strategic self-presentation. Inscriptions at such sanctuaries, he suggests, functioned as vehicles for expressing regional or political identity in a multivocal space. This interpretation chimes in with similar considerations developed, from a different angle, by Nino Luraghi in recent work.

Chapter 6 draws the various strands of the book together and attempts to place the quantitative findings within a broader historical framework. Loy tests whether two historically attested alliances – the Kalaureian amphiktyony and the Ionian League – are at all reflected in the material patterns identified in the previous chapters. The results are striking. For the Kalaureian network, there is no consistent archaeological pattern linking the member sites. As for the Ionian League, only weak socio-cultural affinities emerge, primarily in the form of shared alphabetic practices, yet even here economic and political ties appear to operate largely independently of one another. Rather than viewing such discrepancies as due to gaps in the data, Loy uses them to challenge traditional assumptions about cohesion in the Archaic world. He emphasises the agency of individual communities, which appear to have chosen their affiliations pragmatically – aligning themselves through ceramic distribution, coinage standards, or alphabetic display depending on local conditions and priorities. Geography, in Loy's reading, is less a constraint than an opportunity: networks emerge not from sheer proximity or from putative ethnic bonds but from the accumulation of strategic decisions. The chapter's central insight – that material connectivity often cuts across or even contradicts textual claims to political unity – is striking, and will be sure to generate much discussion (and should definitely be taken into account by historians of Archaic Greece). Some questions remain open: who exactly are these maritime traders who are the real protagonists of the narrative built by Loy? The assumption seems to be that they originate from the communities that are at one end or the other of the supply chain, hence the focus on strategic, pragmatic decisions of communities? But can they also be third parties chartered by members of the exporting or importing community (e.g. Aeginetans

or, at a later date, the Phaselites of Dem. 35?) Does this affect the argument in any way?

The conclusion takes stock of the book's findings to ask broader questions of political and economic organisation in early Greece. Loy argues that commodity-based economic networks began to form as early as the seventh century BCE, initially at the local level but gradually extending across the Aegean. These networks appear to have developed in sequence: ceramic circulation laid the groundwork for the movement of marble, which in turn helped to structure the spread of coinage. The model proposed is, therefore, cumulative, as it were: older routes and relationships are repurposed to support new forms of exchange. What is striking, however, is the frequent misalignment between economic and political networks. Loy highlights cases such as Rhodes and Ionia, where sustained economic ties coexisted with political fragmentation, in contrast to more internally cohesive regions like Attica. Historically attested alliances such as the Kalaureian Amphiktyony or the Ionian League, therefore, do not map easily onto the material record. Loy posits that this disconnect is not an evidentiary problem to solve, but rather an evidentiary 'fact' to be taken into account in our historical reconstructions: textual and archaeological evidence capture fundamentally different layers of interaction. Rather than positing a single trajectory toward state formation or the emergence of the polis, Loy advocates a more piecemeal, bottom-up account. Communities large and small engaged in a range of affiliations shaped less by ideology or institutional identity than by pragmatic concerns – access to goods, routes, and reputational capital.

There is a real effort throughout the book to situate the project within broader shifts in archaeological method – especially the move from descriptive cataloguing to more data-driven approaches. And to his credit, Loy makes the technical aspects of his work accessible. The diagrams are clean and often striking, and the discussion of method in the introduction is refreshingly clear, especially given how murky this kind of work can become. There are, however, some issues – some questions and perplexities, to be precise – about transparency in the presentation of the evidentiary base. Despite the extensive appendixes available online, Loy does not really make much of an effort to present his data in such a way that his analyses can be easily reproduced and/or falsified. His tables and graphs rarely make his data points explicit and checkable by others, and this has costs in terms of transparency and reproducibility. He built his edifice and then, as it were, took away the scaffolding – we see the edifice

but we lack the details of its construction. Even the datasets that he provides in the appendixes are at times not very helpful (e.g. with ware assemblages, where publications are provided without relevant page numbers, so one would need to read them all...), and checking specific claims or reconstructing the grounds for some of the figures used in maps and charts (e.g. when it comes to coinage, where one notices some discrepancies) can be frustratingly difficult, if not impossible, short of doing the whole work anew. This matters because the book's conclusions rely heavily on data manipulation that needs to be truly open to scrutiny. How accessible, and popular, Big Data will become among historians and archaeologists depends also on this.

That said, the book has the considerable merit of pointing the way towards new ways of working with old data, and there is no denying that this is a serious and thought-provoking attempt to rethink how we study connectivity in early Greece, as well as opening up the debate on how to work with Big Data in our subject. It asks questions worth grappling with – and reminds us that the big datasets sitting in archaeological archives are not just the residue of past projects, but potential sources for reimagining the field.

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John Ma, *Polis. A New History of the Ancient Greek City-State from the Early Iron Age to the End of Antiquity*. pp. 713. Princeton: Princeton University Press, 2024. ISBN: 9780691155388, hardcover £ 42.00.

John Ma's new *magnum opus* is over a decade in the making. Originally delivered as the Stanford University 2011 Eitner Lecture on the Greek city-state (pg xv), Ma's *Polis* is a *tour de force* that seeks to undertake a penetrating new analysis of the eponymous ancient political community. Assembling an encyclopaedic quantity of evidence for ancient *poleis* dating between the Early Iron Age and the End of Antiquity, and weaving a new narrative about the rise and success of early Greek institutional mechanisms, Ma aims to radically shift our understanding of how, when and where the ancient *polis* was so defined.

In his opening chapter, Ma sets out his framework: whereas others might have emphasised the diversity of communities encompassed by the term *polis*, Ma adopts a more 'unitary' (though flexible) definition, that a *polis* is simply 'an urban settlement of contiguous habitations', a place that gives its name to a people who may or may not control a territory (pg 13); and what makes these units uniquely *polis*-like, he argues, is their statehood – that these are complex societies whose institutions and measures of self-governance define their very existence as political units (pg 16–7). Ma sets to explore a broader geographical and chronological scope than is usual for *polis* studies, moving beyond the Aegean focus of the Archaic and Classical periods to look Mediterranean-wide (as far as data-evenness allows) between *c.*1100 BCE and 400 CE. Ma also outlines that his framework will be Aristotelian, a view of the *polis* that will focus on the institutions that people (read: adult male citizens, *cf.* pg 503ff.) operated.

Considering that the nature of the political community has received so much scholarly attention within the discipline of ancient history (and outside, too, where state theory more broadly abounds in the American anthropological literature), Ma in his opening chapter is remarkably efficient in distilling the debate to its absolute essentials and in keeping the bibliography trim. There is, for instance, some discussion of the era-defining project of the Copenhagen Polis Centre to categorise the nature of the *polis* (pg 17), but rather than giving a full account of the decades-long discussions and debates (or of other projects on whose shoulders Ma sits, notably those of Gustave Glotz, Victor Ehrenberg and Peter Rhodes), Ma simply notes where his own definitions of the *polis* will differ from that of the CPC (namely, on the importance of civic autonomy to the *polis*). Flicking ahead to the volume's conclusion, one sees that this is intentional, and that rather than getting bogged down in the extensive historiography of the *polis*, Ma regards such a feat as a separate project against which one can test his new reading (pg 543ff.). His aim here, rather, is to take a more inside-out view of the *polis* and its institutions.

The main core of Ma's text (chapters 2–14) comprises a chronological overview of the *polis*, and the various types of evidence that we can use to track its development. Ma tracks the seeds of the *polis* to around 1100 BCE, where competition and desire for status co-ordinated networking between different political units, thus causing more dispersed communities to aggregate into 'clustervilles'. This proto-*polis* he traces all the way to *c.*700 BCE, where a shift to larger and more monumentally elaborate