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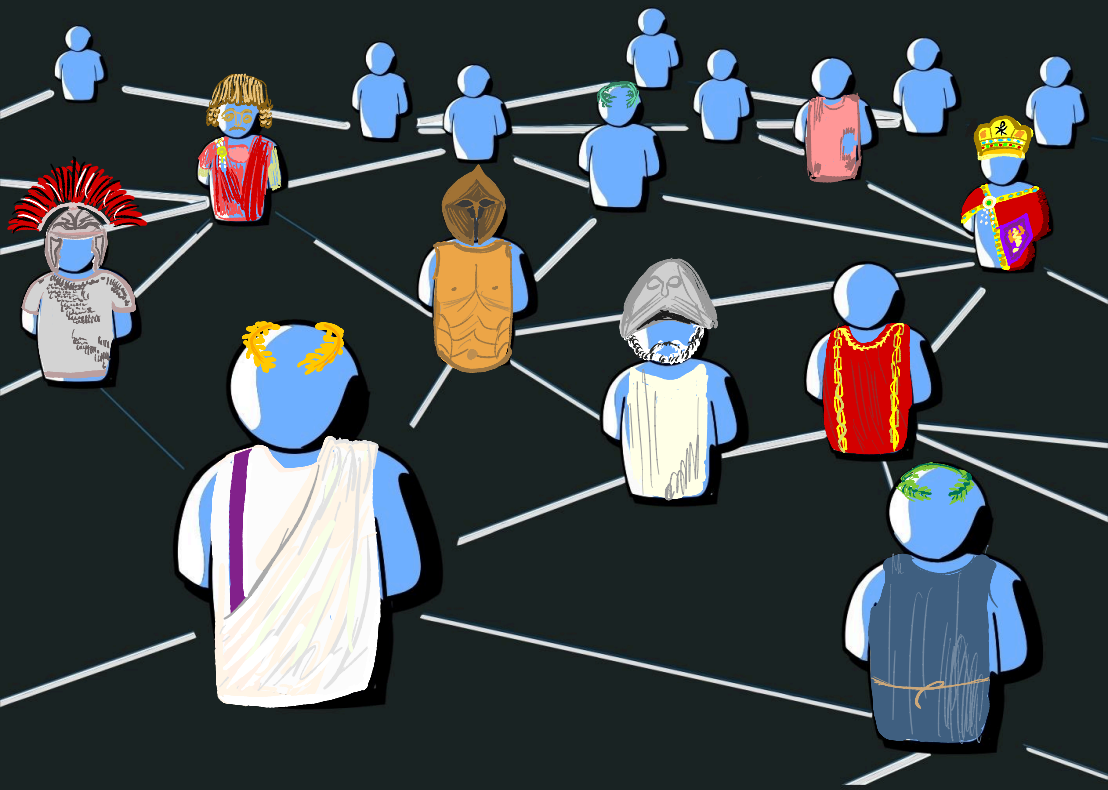

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THE TIES THAT BIND
ANCIENT POLITICS AND NETWORK ANALYSIS

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An Epilogue

Social Network Analysis and Greco-Roman Politics

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Abstract

A short synthesis of the chapters included in this volume with a critical reflection on the plus-value of social network analysis in ancient history.

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1 Introduction*

This volume's studies apply different techniques to different data-sets and reach different short-term conclusions about the networks of the ancient world. These are not contradictions, but opportunities for cross-fertilization, future lines of research for comparison against these results. Indeed, we have for the first time an opportunity to do basic comparative work. This volume draws on literary, documentary and epigraphic evidence and employs several different network analytical techniques, but ultimately manages to draw internally consistent and mutually reinforcing long-term conclusions about the nature of Greco-Roman politics. To trace the threads leading to these conclusions, this chapter provides a brief summary of each chapter and amplifies on specific points, where appropriate, before drawing a bird's eye view of the volume as a whole. This view provides a hint of potential historical network analysis still to come on data from the ancient world. The chapter ends with a methodological note on network analytical best practices, coupled with a healthy dose of skepticism: network analysis is a useful tool for the analysis of antiquity, but perhaps not in the way we have thought it is.

First, to the chapters themselves. Cline analyzes the social networks around Pericles and Socrates as found in the works of Plutarch, Plato and Xenophon. The result is a statistical claim that fifth-century Athens was a "small world."[1] (And a further claim that only Pericles and Socrates alone in fifth-century Greece left enough evidence for modern authors to construct their ego-networks.) Building the Periclean social network through Plutarch's life of Pericles alone tells us little we could not have worked out in other ways. The chief advance here is the discovery that women score disproportionately well in the measure of betweenness centrality: Periclean women connect different parts of his network. A real social phenomenon stands behind this result, the role women play in connecting families through marriage. The next step is to add more data, from more of Plutarch's lives. The most obvious result is an "interconnected and cohesive" network connecting Pericles, Alcibiades, Nicias and Cimon, a network again privileging the female role in betweenness centrality. A further result, one buried in the data, is the exact nature of the network's small-worldness, the fact that everyone in it is connected by, on average, just a shade

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1 Small worlds have become intensely studied in network analysis in the last twenty years. The concept itself goes back to relatively early work in the field: see particularly MILGRAM (1967); GRANOVETTER (1973); GRANOVETTER (1983).

over three degrees of separation.[2] Adding Socrates to this network, through the connections found in the works of Plato and Xenophon, puts him immediately at the center of the network, and in an interesting result, decreases the average number of connections between each person in the network: Socrates brings our network closer together.

This piece provokes us to think through the implications of how we assemble our data. A small-world network is, I think, exactly what we might expect from a data-set created out of different biographies. Generalizing, a small-world network comes into being when a perfectly ordered network is altered through the introduction of a few randomized connections.[3] Taking four of Plutarch's lives and connecting them to each other does essentially that. Presumably, Plutarch was not thinking about the social connections he portrayed across his lives in anything more than a casual way. The connections that do spring up between these lives are therefore essentially random, still more so with connections between Plutarch, Plato and Xenophon. They are real connections, to be sure, but essentially picked out of a hat. They act to create the small-world effect themselves. What we want to do next is test that effect against a data-set assembled another way. A single literary work crafted by a single author with a single purpose -- Thucydides, for example, on the Peloponnesian War -- presents a pre-packaged data-set unified by authorial intent, in which the combination of smaller groups of data does not introduce any particular randomness. Would such a data-set still show fifth-century Athens to be a small world?

In a fast-forward several hundred years, we move to the Roman world, where Vogel takes a "rather metaphorical" approach to networks, seeing them as communication structures crucial to Roman rule in the periphery.[4] The metaphorical approach is grounded in a belief in "the verdict that no fully fledged social network analysis can be implemented" on historical data. (But he is being modest, as we will soon see.) The vehicle for exploring the metaphor is the career of Q. Tullius Cicero, particularly his time in Gaul and in Asia. If his brother's letters are believable, Quintus had trouble in Asia, and his time as governor generated discontent among both the locals and the Roman *publicani*. Thus, the shape of his network and how he uses it determines the nature of Roman rule in Asia. This is abstract, but takes a more concrete shape in Gaul,

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2 The network also meets the other key characteristics of a small-world network, namely that its degree of connections follows a power-law distribution curve and that it has a relatively high clustering coefficient.

3 WATTS / STROGATZ (1998); WATTS (1999); WATTS (1999b); WATTS (2003).

4 Ancient network analysts have struggled over whether to take networks as metaphors. MALKIN (2011), p. 16 prefers "network" as "a descriptive and heuristic term."

where Cicero's letters give Vogel the raw data for network analysis.[5] But Gaul is at war in the 50s, and its networks are not stable, particularly when other Gauls put pressure on the Nervii, Rome's recently subdued allies, to turn against Rome.

Balance theory maps the possible outcomes in this scenario: when one member of a triad finds the other members in conflict with each other, that first member must take action to restore balance to the network.[6] Here, the Nervii choose Gallic solidarity over their alliance with Rome. Turning back to Asia and applying balance theory here too, Vogel finds that Quintus has nearly as many negative connections as positive ones, at least when viewed through his brother's letters. It seems that Quintus needed his brother's positive connections to bring his rule in Asia more firmly into a positive network balance. The author is not bold enough to make this claim, but a generalized network principle of Roman rule in the provinces is implicit. When Rome can build a provincial social network in positive balance, its rule will succeed.[7] When it cannot, it will have to add further social connections or keep fighting until it can.

Gilles proposes to put Cicero's letters to different purpose, as an entry-point to the civil war between Caesar and Pompey in 49-47 BC. Network analysis can explain political affiliations, and in this case, potentially determine whether Roman senators chose sides based on family ties or political ones. The method for data collection and analysis is a model of transparency and clarity. We know exactly what Gilles has done with Cicero's letters, and how he has coded them. Gilles is also unusual for questioning the utility of network analysis, and treating that utility as a thing to be proven, rather than taking it as a given. Cicero's letters may be the best surviving vehicle for the task, but pose their own problems. Will the network view not look necessarily skewed towards Cicero's vantage point, especially when – as Gilles himself points out – Cicero is writing from Pompey's camp? Gilles is restrained in his conclusions: "families did not follow a particular trend or pattern" (p. 144) in their affiliation, and determining "whether all Senators were influenced by family or faction in their decision to support either Pompey or Caesar… has proven difficult" (p. 153). I wonder whether we could reasonably expect otherwise: a network counter-study would

5 Cicero's letters were already subject to network analysis in what may have been the earliest application of the method in the field: Alexander / Danowski (1990).

6 For balance theory, see originally Cartwright / Harary (1956), exploring the social tension which exists when two people with a positive relationship hold different opinions about a third party. For its full-scale application to network theory, see De Nooy et al. (2005), p. 86.

7 A balanced network "consists of two factions and actors only have positive ties with members of their own faction" (De Nooy et al. [2005], p. 86).

search for a case in which family and faction would stand clearly separate in the Roman Republic, which might prove very hard to find.

Rosillo-López, like Vogel and Gilles, also enters the politics of the late Roman republic through Cicero's letters. The focus is on face-to-face conversations, particularly political conversations. This takes ancient network analysis into uncharted territory by adding an additional analytical abstraction, the actual form of communication. A second layer of shifting discussion networks (interpersonal political communications) lies behind the first layer of mere attestations in the written evidence. The analysis of "people who did not meet intentionally" (p. 104), that is, the absence of connections in this period, is illuminating. Cicero misses out on several key face-to-face meetings – particularly with Marcellus minor and Mark Antony – which could have altered his decision to pick the Pompeian side early in the civil war. I once tried a similar approach on the sixth-century AD Egyptian village of Aphrodito, trying to determine whether measures of "social distance" and absence could highlight village political factions.[8] Rosillo-López implicitly prompts us to take the idea further, to ask whether there is a way we can start doing negative network analysis, by creating instead a full picture of all missing ties as a way to explain political antagonism.[9]

Pompeii is a unique case in the ancient world: the circumstances of its destruction preserved unparalleled levels of evidence. Accordingly, Broekaert's contribution on Pompeii is unique in this volume. It alone turns from the literary evidence towards the epigraphic evidence, which Pompeii provides in vast troves. Broekaert uses network analysis to engage in the debate over whether Pompeiian society was a "democratic community with high levels of social and political mobility [or] a more traditional Roman city with well-established families dominating the political scene" (p. 158). Given the excess of evidence -- over 10,000 published inscription -- Broekaert has to be selective. To analyze the elite, he focuses on candidates for and holders of the city's chief magistracies and priesthoods. To analyze the sub-elite, he focuses on the wealthy *augustales* on the one hand and the slaves and freedmen *ministri* and *magistri* on the other.

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8 Ruffini (2008b), particularly p. 163-165, where I wondered why some connections which ought to have existed in certain texts from Aphrodito under the consensus understanding of those texts were not in fact apparent. The result was necessarily a series of questions rather than definitive answers.

9 Many network analytical studies make use of positive and negative ties, but a missing tie is not the same as a negative one. Methodologically, we must ask whether the absence of evidence is more likely to, in fact, be the evidence of absence or the evidence of hostility. If the latter, our missing ties become much more revealing than we have realized.

He is admirably transparent about the process of data collection, a process culminating in a data-set of 938 individuals connected through 1156 ties.

The conclusions are intriguing. In the earliest periods, colonist families do tend to have a slight political advantage over native families. The late Republican data includes many members of the Pompeiian elite not connected to anyone else. Broekart's claim that this is not simply a phenomenon of epigraphic survival rate will not convince everyone, but he is right: wealthier elites are both more likely to be well connected and more likely to create epigraphic activity.[10] The Julio-Claudian period is sparsely documented for Pompeii, but Broekaert has more to work with in what he calls the Neronian-Flavian period. In this period, successful political candidates are clearly those with more connections. The *quinquennales* -- those holding the town's peak political office -- are at the center of the town's network and control its connections. More powerful Pompeiian politicians tend to be connected to those like them, while less powerful politicians tend to be connected to their supporters. Analysis of the early-career aedilicians makes use of the relatively underutilized dyadic constraint measure to determine how dependent candidates are upon their social connections.[11]

These measures have all relied on ego networks and sub-networks. Betweenness centrality lets Broekaert measure the importance of an individual across the entire network. The top-ranking Pompeiians by this measure are almost all members of the elite. Studying brokerage in and between affiliation groups (*e.g.* elite versus non-elite) yields less easily anticipated results. Someone consulting a menu of political options in Pompeii – whom to consult with for which sorts of political results – would ultimately find relatively few ways forward: "Only 5 people appear to have played every single brokerage role available" (p. 205). But these people spanned the spectrum, from elite families of long-standing prestige to relative newcomers still fresh with the glow of recent success. A final section tackles the greatest challenge in historical network analysis, change over time. Tracking Cramér's V and Rajski's information index through Pompeii's different periods, Broekaert shows that "absolutely no, or only a very weak, association" (p. 207) exists between families during consecutive time periods. Association measures which are essentially no

10 On the question of evidentiary survival rate and network analysis, see RUFFINI (2008), p. 254.

11 The measurement is difficult to understand: why for instance do C. Sallustius Capito and P. Vedius Nummianus have different levels of constraint when they have primary and secondary circles of the same size? How far out does this constraint measure reach?

different from random strongly suggest that turnover among elite families must have been much higher than earlier scholars have thought.[12]

Germerodt enters the politics of the early Roman empire through Pliny's letters. An interesting methodological challenge faces us here. Ego networks extracted from epistolary collections are highly granular. We do not see a universe of social connections, but glimpses of small groups of people at a time. In some cases, the connections are quite negative. M. Aquilius Regulus, "some kind of nemesis" to Pliny, "happens to be one of the most mentioned and single best described person in the whole collection" of Pliny's letters (p. 264-265). Pliny's own network shows his connections to be connected to each other, "true networks," in other words, "rather than merely a series of loose relations" (p. 269). This is reassuring. It means the evidence is robust enough to support real conclusions. But sometimes those conclusions may work in only one direction. Perhaps Regulus agitated Pliny in a way that was not mutual. We do not always know whether these connections would look the same viewed from the other side.

Dyadic reciprocity is at the heart of Koestner's analysis of the social network of L. Aelius Seianus (commonly known today as Sejanus). Sources portray his rise as an individual effort, when in fact he is surrounded by a network both of people whom he supports and people who support him. Many of these connections are with relatives of his parents and grandparents, while others are his own additions, in Italy and overseas. Sejanus's network of friends did worse in his aftermath than his network of family. Thus, fallout from his career proves his acquired dyadic connections to be very fragile. Two basic principles of politics and social connections emerge from this discussion. First, networks are additive. They grow over time, at least in part through conscious effort. We must be wary of static diagrams, which can obscure this fact. Second, some parts of a network are stronger or weaker than others, are more susceptible to the removal of one of its central pieces than others. Composite statistics of a network thus tell us relatively little without sensitivity to the statistics of specific network regions.

Nitschke's chapter on Ostrogothic Italy is the first study of the ancient world – to my knowledge, at any rate – to show how the type of government can alter the shape of its consequent political networks. The concept of "network management" implies the presence of the manager, in this case a political autocrat, Theoderic the Great. The less democratic a political space, the more one single person has "responsibility for the selection of actors which are

12 Comparison against random results remains an underutilized approach in ancient network analysis. Compare this case against, e.g., RUFFINI (2008), p. 132-138.

allowed into the network structure" (p. 274). Thus the shape of a political network under an autocracy as it presents itself in the evidence is neither an accident nor an innocent and untainted glimpse of a "true" political reality. It is instead a very deliberate construction, a network shaped by the autocrat, for the autocrat. This is a tantalizing conclusion, one that leaves us wondering about the other networks in this book. Many of our authors describe their networks and draw conclusions about the politics implicit in those networks, but do not think of their networks as managed constructs shaped by players with active agency. Can we suppose that Alcibiades, for instance, or Cicero -- to take two very different examples -- are not involved in network management of their own? If they are, how does that alter our impressions of Cline's conclusions, or Rosillo-López's conclusions?

Preiser-Kapeller, a Byzantinist, writes of what he calls the "medieval Roman Empire," a vastly different creature from the Rome of this volume's other contributors. Network analysis of members of the Byzantine aristocracy in the early 1300s sheds light on political factionalism in this period. The results suggest a low level of structural polarization, but nevertheless also suggest a tendency towards fragmentation, which is precisely what we see playing out during that period's civil wars. The quality of evidence does not permit the same level of detailed analysis of the rebellion of Bardas Skleros in the late 900s. Here the results are more impressionistic. The Skleros family is an example of an elite family straddling the border between Byzantium and the world of Islam, with deep social and kinship networks on both sides of that border. The Byzantine emperors are power-brokers positioning themselves at the "centre of a network of aristocratic clans and individuals of heterogeneous backgrounds" (p. 302). Bardas himself acts as a broker between different groups in much the same way, a phenomenon which helps to explain how his revolt is viable in the first place. But the center's stronger brokerage power ultimately fractures his network and leads to his defeat.

This is consistent with conclusions found elsewhere in this volume. As Cicero and Caesar found, successful imperial rule in the periphery requires brokerage from the center. As Nitschke argues for Ostrogothic Italy, political networks are not accidents. In the case of autocracies, they are shaped or managed by the autocrat. Nitschke's concept of network management has implications for the other studies. When Cicero finds himself on the outside of several face-to-face communication networks in early 49 BC (see Rosillo-López above), it is not (yet) because he has been scraped from Rome's political network by a central autocrat. Time for that would come in late 43. In network terms, this is what happens in the last decades of the Roman republic: struggle for management of the network culminates in the victory of a single network manager.

An interesting theme unifies this volume's chapters, although we may not see it without distilling some of the essential conclusions. Athens is a small world, made smaller as we add more of its great figures into our data. Q. Tullius Cicero's career shows the importance of adding or altering connections to achieve or maintain political balance. His brother's career shows that *missing connections* help explain the outcome of the civil war that broke out on Caesar's return from Gaul. Evidence from Pompeii highlights another kind of missing connection, the lack of strong associations across time-periods for Pompeii's important families. Families remain elite when they continue to forge these associations, while missing connections are a sign of political illness and ultimate death. The networks and career of Sejanus demonstrate this point with clarity: his success is not an individual's success, but the success of a growing network. His failure comes with network collapse. In Ostrogothic Italy, networks take shape as Theoderic manages them, directly determining whom to add and remove. In the medieval Roman Empire, the center's ability to fracture peripheral social networks helps suppress revolt and maintain central control.

Put another way, political success in the Greco-Roman world correlates to the ability to grow, manage and maintain one's social networks. This conclusion tends to relegate socio-economic status and wealth to secondary importance.[13] Anyone can succeed politically, with the right network management, and anyone can fail, with network negligence. This conclusion impacts the observer's modern scholarship as well. The Athenian example shows Socrates moving into social primacy the more data we sample. Thus our own conclusions about who is politically successful in the Greco-Roman world themselves correlate to our ability to grow and manage our data. This has implications for our network analytical best practices, a subject I explore in further detail below. The ultimate lesson is clear: both politics and scholarship are additive. The more connections we have and the more data we bring to the analysis, the better the results in each.

Testing this conclusion requires further work. The directions for future researches are embedded implicitly throughout this book. Each contribution points towards other types of evidence and other types of structures to invite comparisons of social networks across the Greco-Roman world. A few examples suffice. This volume's conclusions about Athens from the literary evidence invite comparison to networks from other types of evidence, particularly Greek epigraphic sources, and to other places and times. First, do women appear as

13 Indeed, this appears to me to be a tendency in social network analysis as a whole: social structures are less important than the agency with which one moves through them. But consensus on this impression is lacking: see note 15 below.

central in-between figures in other cities at comparable stages of development? Second, if the small-world effect enables the Athenian Golden Age, what does that tell us by implication about other cities? Other cities with or without similar network features will let us test the Athenian results. Likewise Cicero, whose correspondence lets us measure the network shapes of Roman rule in the provinces. Assembling other data-sets – again, perhaps from epigraphic evidence – can test the results we find in Cicero. Looking at home in Rome, the strength of weak ties in Cicero's correspondence highlights one network structure for the recommendation of junior colleagues. What other bodies of correspondence – perhaps Pliny or Libanius – might show the same function for weak ties?[14] The role of *amicitia* in Pliny's correspondence lets us compare the different shapes of patronage in a Roman social network. Do the conclusions we form about network management under an autocracy hold across other forms of government? Does informal communication between politicians in the late republic produce similar patterns of behavior as informal communication in a radical democracy or under one-man rule? Do the conclusions we draw about the friends and family networks of Sejanus under Tiberius look similar to those we draw about politicians in the late republic? Why or why not?

Social network analysis admits to no theoretical or methodological unity. The field's heterogeneous origins ensured the diversity of theoretical perspectives. This heterogeneity does have drawbacks. From the very beginning of historical network analysis, there has been no agreement about the role of agency versus the role of social structures in historical networks.[15] Early practitioners found networks a liberating way to reintroduce agency lost in the formalism of structural analysis. Early critics found networks to be precisely the opposite, a binding form limiting the agency of their members. Later authors on both sides of the divide do not always make their own views explicit, or even think them all the way through. Failure to do so makes it impossible to explain who is doing what to whom in a political context, and network analysis becomes simply a game for its own sake, incapable of explaining cause and effect. Networks are not causes. They are structures. Analysis of them can explain behavior, and thus change over time. But the networks are not themselves the agents. They are merely the forms through which the agents move.

One striking feature of this volume is the wide range of approaches it presents to the problem of describing that form, the problem of turning the raw

14 For work on late antique epistolary networks, see e.g. SCHOR (2011) with a review at RUFFINI (2012).

15 Contrast the anti-structuralist approach outlined in BOISSEVAIN (1974) to FRANZOSI (1996) and FRANZOSI / MOHR (1997), which essentially declare network analysis to signal the victory of structuralism in modern historiography.

data into a final network. It is not clear whether any of our authors collected and synthesized their data in the same way. One author, given the data of another, might readily arrive at a different network and thus at different conclusions. This variability poses a real problem for historical network analysis as a scientific project. It renders almost impossible the verifiability necessary for any scientific experiment. Is it possible to agree to a universal standard, a way to read the data and measure connectivity in which the same data-set would result from the same data every time? In my ideal world, some aspiring graduate student will one day create a platform -- perhaps relying on self-teaching neural networks -- capable of reading any literary, documentary or epigraphic data and generating standardized data-sets of connections customized in response to user-controlled criteria. But until then, what to do?

Transparency is the key. Let me offer several rules for what I consider to be best practices for data collection, data cleaning and data analysis. First, scholars must collect data from a discrete and bounded source. Second, scholars must make that data available to the wider community in both raw and cleaned form. Third, scholars must state explicitly which functions in which software packages they have used to perform their analysis. All of these best practices are necessary to ensure the presence of a fundamental necessity for scientific inquiry, the possibility of falsifiability. I will return to the issue of falsifiability below, after elaboration on these rules. The third rule, on explicit statement of practice, is easily obeyed within the text itself of any article or book on historical network analysis. The second rule is more of a challenge. In some cases space will simply prohibit publication of large data-sets. An online solution is the obvious answer. One day, perhaps my hypothetical aspiring graduate student will also launch an online repository of ancient network data-sets.[16]

The first rule -- that a data-set must be discrete and bounded -- poses the greatest challenge. It is the most important, and the most frequently violated. The data must come from a clearly defined set within a clearly defined source with clearly defined limits. This necessarily prohibits cherry-picking of data from a specific source. It also necessarily prohibits cherry-picking sources. Analysis must include all data within a source or none. Analysis must include data from *all* sources -- often a practical impossibility -- or data from only one. Any of the options in between introduces selection bias. We may want to see what happens when we add a pinch of Plutarch to our Xenophon and Thucydides stew, but in fact we have no way to control the nature and quality of the data from one source to the next. This does not contradict my earlier conclusion, that our results improve with larger amounts of data: we want a

16 Something like this is already emerging at Trismegistos Networks, available at http://www.trismegistos.org/network.

large sample, but we cannot make one artificially larger by tossing our apples in with our oranges. Finally, once within our single source of data, we must have one and only one clear parameter for what constitutes a social connection. Whether the parameter is co-occurrence in the same papyrus or inscription, or a connection through one of a specific set of action words found in a literary text, the parameter must be consistently applied. Otherwise, we are again mixing our apples with our oranges.

In an unpublished talk given at Leiden in 2015, I expressed what I called an evangelist's skepticism about the nature of the social network analysis I had tried to encourage in classical studies over the previous decade.[17] I take the liberty of concluding this chapter with a modified version of those remarks, intended to address more specifically the question of politics in the ancient world. I have, more than anything else, been concerned about how we assemble our data, and the damaging consequences of cherry-picking our data in a way that imbeds our own conclusions into the initial data-set. Consider the following thought-experiment. Take someone proficient in network analysis who is not an historian -- a mathematician, perhaps, or a physicist -- and give that person the raw data from one of this volume's ancient data sets without saying anything about the nature of the data except perhaps that it is from a collection of letters or a series of literary references.[18] How close to our conclusions might this network analyst – a non-specialist in antiquity – come, given nothing but the raw data? I would wager quite a bit that this non-specialist would come to dramatically different conclusions about, for example, what characteristics make up a politically successful Pompeiian family. Removing data from context might give us an interesting way to destroy our ideological or historiographical preconceptions. The network role of women or *augustales* or freedmen must be X, because of what we know about the ancient world. But outsiders imagining a story based on our data will not necessarily know that X has to be true, and may see more clearly that it is in fact false.

Falsifiability is key. Network analysts in the ancient world often reach from their data to conclusions that cannot be falsified. For a conclusion to be useful, for it to be convincing, we need to know what the data would look like under other conclusions. What if the political networks of classical Athens are not actually small-world networks, but the elite simply receive literary portrayals

17 In one of the keynote talks, "Reconsidering Network Analysis: An Evangelist's Skepticism," given at the Papyri & Social Networks conference in Leiden in October 2015.

18 My thought-experiment, presented in Leiden in 2015, was inspired by the actual experiment proposed for the "The Challenge of telling a Network Story in Archaeology" panel at the XXXV Sunbelt Social Network Analysis conference, held in Brighton, UK, June 2015, organized by Angus Mol, Viviana Amati and Habiba.

making them appear to be? What if our understanding of Pompeiian electioneering inscriptions is badly wrong, and the epigraphic remains are the result of a radically different sort of patronage and campaigning? We need to be prepared to imagine a wide range of historical outcomes – a wide range of stories – producing the same sorts of network analytic results.

This ultimately raises the question of tautology. What exactly are we studying? I have become less and less confident over time that these networks are statistically representative of some social reality in the ancient world. How could they be? The vast majority of human interactions do not come with a paper-trail. It is not so great an exaggeration to say that our paper-trail exists *precisely because* the events it documents *are exceptional*. At an international papyrological conference in 2004, I was asked about the significance of adding new papyri to our networks.[19] I replied that adding new papyri would not matter, since we already had a statistically significant sample size. In retrospect, I think I was right, but in the wrong way: we have a statistically significant sample size *of networks based on exceptional interactions*.

Is there a way to reverse engineer this problem? Is there a way to work backwards from the exceptional to the normal, to use the networks that we have to discover the networks we do not have? Maybe, but I doubt it, and that sounds like a problem that would need to be solved on the cutting edge of graph theory, rather than by ancient historians who are only borrowing these tools, not developing them. But maybe we can simply embrace the reality of the problem and work from there. This was one of my key points in my conclusion to *Social Networks in Byzantine Egypt*: the surviving evidence has a shape, and we should measure it.[20] I would now re-phrase this conclusion to match my emergent skepticism: the exceptional evidence has a shape -- and so what we are doing in network analysis of the ancient world is analyzing the shape of the ancient world's social networks in abnormal circumstances. The conclusions we draw about the social structures of the ancient world are conclusions about those social structures when they are bent, distorted, or sucked into the gravitational pull of specific -- and specifically atypical -- circumstances.

Let us see what this looks like with concrete cases. In my own study of the Byzantine Egyptian village of Aphrodito, I argued that its social networks were relatively egalitarian and decentralized.[21] Consider re-casting this as an argument for exceptional circumstances. Aphrodito's social networks were

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19 The question came in the context of using network analysis to analyze the topography of the Oxyrhynchite nome, one of the best-known regions in the ancient world in terms of its documentary evidence. The ultimate product of that analysis was Ruffini (2007).

20 Ruffini (2008), p. 254.

21 Ruffini (2008), p. 198-241.

relatively egalitarian and decentralized when measured through the prism of actions requiring legal contracts and state monitoring. This may suggest that the very act of entering into formally binding legal arrangements with a written paper-trail may smooth out the visible edges of social hierarchies, because the very things that made the ancient world so unequal, so hierarchical -- patronage and social status -- are not the factors creating or destroying social ties in these documents. This has implications for the studies presented in this volume. It suggests that the very act of putting Greco-Roman politics into the written form distorts our view of that politics. It suggests that our conclusions about the nature of Greco-Roman politics rely on evidence generated under unusual circumstances, when it stopped working, when it was about to start working, when it needed to show to the world exactly how it worked. And behind the scenes, hidden in the evidence no one needed to write down, may lurk a very different politics indeed.

This is simply an hypothesis. But it lets me confront my skepticism directly. I continue to believe that network analysis is a useful methodology for the study of the ancient world. But I can no longer claim that it is simply a matter of entering the data into the computer and analyzing the results that come out the other end, imagining that they represent the social reality of the ancient world. Rather, network analysis is likely to become only the first step in a longer and more complicated process. It does let us measure the shape of the surviving evidence, to gain a "God's eye view" of all of the surviving social connections. But then we must go a step further, and form and test hypotheses about what factors distort this evidence, what changes in the fabric of ancient society as it is squeezed into the mould of the written word to meet the circumstances of any given corner of the written world. And then, in turn, we must duplicate and re-test these hypotheses as they are put forward by others, in a truly iterative and scientific collaboration.

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